Option 11 & Meridian 1

Intelligent Peripheral Equipment Circuit Cards for India

Description and installation

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About this document

This document describes the functions and applications of the following circuit cards that are available for use in India:

— NTCK18DA Extended Flexible Central Office Trunk card (XFCOT)

— NT5D29AA Universal Central Office Trunk card (XCOTI)

— NT5D28AA Universal Direct Inward Dialing Trunk card (XDIDI)

— NT5K02KA Dutch Flexible Analog Line card (XFALC)

— NT5K83FA Swedish E&M TIE Trunk card (XFEM)

General information

Overview

This chapter provides general information on requirements for configuring a Meridian 1 system in India. The software overlays 56 and 17, which follow, provide the country specific tones and cadences and Aries transmission parameters recommended for India. A description of the India Phase 2 feature, which enables R2 Multifrequency Compelled (R2/MFC) signaling for India, is also included in this chapter.

Country specific tones and cadences

In May 1994, India's Department of Telecommunications designated the following tones as generic requirements for a PABX with DID facility:

— Dial Tone
400 Hz modulated by 25 Hz continuous

— Call Routing Tone
400 Hz with periodicity 100 ms on, 900 ms off

— Congestion Tone
400 Hz with periodicity 250 ms on, 250 ms off

— Ring Back Tone
400 Hz modulated by 25 Hz with periodicity 400 ms off, 200 ms on, 400 ms off, 2000 ms off

— Busy Tone
400 Hz with periodicity 750 ms on, 750 ms off

— Number Unobtainable Tone
400 Hz with periodicity 2800 ms on, 200 ms off

— Ringing Tone
75 V 25 Hz AC with periodicity 400 ms on, 200 ms off, 400 ms on, 2000 ms off

— Intrusion Tone
400 Hz with periodicity 150 ms on, 4850 ms off

Use overlay 56 to configure the tones and cadences required for call progress in India, as described in Table 1.

Table 1
LD 56 Flexible Tones and Cadences Data Block (Part 1 of 4)

Prompt	Response	Comments
REQ	CHG	Change
TYPE	FTC	Flexible Tones and Cadences data block
TABL	1	FTC Table number
RING	<CR>	Ringing feature definitions
HCCT	YES	Hardware Controlled Cadences and Tones
- DIAL		Dial Tone
- - XTON	105	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- SPCL		Special Dial Tone
- - XTON	105	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
-CDT		Control Dial Tone
- - XTON	004	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- CFDT		Call Forward Dial Tone
- - XTON	105	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	017	XCT (NT8D17 Conference/TDS) Cadence number
- MWDT		Message Waiting Dial Tone
- - XTON	105	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	017	XCT (NT8D17 Conference/TDS) Cadence number
- CFMW		Call Forward Message Waiting Tone
- - XTON	105	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	017	XCT (NT8D17 Conference/TDS) Cadence number
- BUSY		Busy Tone
- - XTON	158	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	016	XCT (NT8D17 Conference/TDS) Cadence number
- RGBK		Ringback Tone
- - XTON	160	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	031	XCT (NT8D17 Conference/TDS) Cadence number

Table 1
LD 56 Flexible Tones and Cadences Data Block (Part 2 of 4)

Prompt	Response	Comments
- ARBK		ACD RGA (Ring Again) Ringback Tone
- - XTON	011	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	002	XCT (NT8D17 Conference/TDS) Cadence number
- FFCT		Flexible Feature Code Confirmation Tone
- - XTON	004	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- ACTN		Active feature Dial Tone
- - XTON	105	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- HOWL	0027	Howler Tone
- LIMT		Log In Mode Tone for 500/2500 ACD sets
- - XTON	009	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	002	XCT (NT8D17 Conference/TDS) Cadence number
- NRMT		Not Ready (NRDY) Mode Tone for ACD sets
- - XTON	009	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	018	XCT (NT8D17 Conference/TDS) Cadence number
- AWUT		Automatic Wake Up special error Tone
- - XTON	158	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	017	XCT (NT8D17 Conference/TDS) Cadence number
- OVFL		Overflow Tone
- - XTON	158	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	017	XCT (NT8D17 Conference/TDS) Cadence number
- TEST		Test Tone
- - XTON	008	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- ACFT		ACD Call Force Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- TLP		Tone to Last Party

Table 1
LD 56 Flexible Tones and Cadences Data Block (Part 3 of 4)

Prompt	Response	Comments
- - XTON	007	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- TLPT	0	Tone to Last Party Timer in seconds. No tone = 0.
- PATI		Patience Tone Multi-party Operations.
- - XTON	000	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- SCCT	YES	Software Controlled Cadences and Tones
- CAMP		Camp-On Tone
- - XTON	137	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	017	MCAD software cadence number
- AOBT		Agent Observe Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- INTU		Intrusion Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	019	MCAD software cadence number
- CWT		Call Waiting Tone
- - XTON	137	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	020	MCAD software cadence number
- OBKT		Observe Blocking Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	017	MCAD software cadence number
- OVRD		Override Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number

Table 1
LD 56 Flexible Tones and Cadences Data Block (Part 4 of 4)

Prompt	Response	Comments
- - CDNC	018	MCAD software cadence number
- SRT		Set Relocation Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	021	MCAD software cadence number
- TMAT		Telephone Messaging Alert Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	022	MCAD software cadence number
- TMOT		Telephone Messaging OK Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	023	MCAD software cadence number
- TSUT		Telephone Status Update Tone
- - XTON	003	XCT (NT8D17 Conference/TDS) Tone code
- - XCAD	000	XCT (NT8D17 Conference/TDS) Cadence number
- - CDNC	023	MCAD software cadence number
SRC	<CR>	Source
PULS	<CR>	Pulse timers

Changing Aries transmission parameters

The transmission parameters for digital sets and consoles are configured in LD 17, as described in Table 2.

Table 2
LD 17 Change Aries Transmission Parameters

Prompt	Response	Comments
REQ	CHG	Change existing data block
TYPE	ATRN	Aries Transmission
- CODE	2	CODEC Coding Law
- SOLR	1	Sidetone Objective Loudness Rating
- ROLR	0	Receive Objective Loudness Rating
- TOLR	63	Transmit Objective Loudness Rating
- AGCD	YES	Automatic Gain Control Disabled
- VOLR	NO	Volume Reset
- HRLR	0	Handsfree Receive Objective Loudness Rating
- HTLR	51	Handsfree Transmit Objective Loudness Rating

India Phase 2

R2/MFC signaling for India is provided in a feature called India Phase 2. R2/MFC signaling for India modifies the existing R2/MFC signaling operations of the Meridian 1 to meet the needs of the Indian market. Using R2/MFC for India, a Meridian 1 system can work with both analog and digital (DTI2) interfaces to support India's R2 modified MFC signaling. This feature requires a minimum of X11 Release 23 software and the Multifrequency Compelled Signaling (MFC) package 128.

The development of R2/MFC signaling for India introduces two new prompts in Overlay 16. The India R2/MFC (INDMF) prompt enables R2/MFC operations for India. The CNI length (CLEN) prompt allows for the selection of between one and 16 digits for Calling Number Identification (CNI) operation. CNI operation for India requires 10 digits to be configured at the CLEN prompt. The information provided by CNI can be used for appropriate displays in the system and in features like Malicious Call Trace (MCT).

For India, the following enhancements have been made to existing R2/MFC signaling operation:

— Since India's Central Offices use MFC signaling that support signals defined on 2 out of 5 frequency combinations, a Meridian 1 in India must be configured to recognize only 10 signals. Thus, only 10 frequency signals should be configured in Overlay 94.

— CNI operation in India allows the terminating party to send the Send Category (SCAT) signal at any time while the address information is being exchanged in the protocol. For this to occur at the originating end, the SCNT prompt in Overlay 94 must be set to YES.

— The Called Line Free with Metering signal (B.6) is used in India to indicate that the called party is free from calls (idle). The Meridian 1's existing IDLE signal should be configured as B.6 to meet this requirement.

— The Called Line Free With No Metering signal (B.7) is not supported by Meridian 1 systems in India and should **not** be configured because it is used for test purposes.

— India's Central Offices use the A.2 signal, Restart, to request the originating party to start resending the dialed digits from the beginning. The existing Tandem First (TFST) signal should be configured as A.2 in Overlay 94 for the Meridian 1 to support this signal.

— The A.3, A.4, and A.5 signals are used in Overlay 94 for the application of CNI signals. In the operation of R2/MFC signaling for India the A.3 signal acts as the MFC Complete signal, A.4 acts as the Send/Receive CNI signal, and A.5 acts as the Send/Receive CNI category signal.

— The length of CNI digits for India is fixed at 10. Once the terminating end receives 10 digits, it sends a COMP signal to end the CNI sequence and the level 1 signaling. For R2/MFC signaling in India, the maximum number of CNI digits should be defined as 10 in Overlay 16. However, configuration of up to 16 digits is now available as a result of this feature.

Operating parameters

For a tandem Meridian 1, the incoming and outgoing R2/MFC Data Blocks should be configured with different values of EECD in Overlay 94. This will prevent a Meridian 1 nearest to an Indian CO from establishing an end-to-end connection between the Indian CO and a far-end Meridian 1 that may not support R2/MFC signaling for India. The far end Meridian 1 must have SCNT set to YES in Overlay 94.

Feature interactions

There are no specific Feature interactions for this feature.

Feature packaging

India Phase 2 requires the MFC package 128.

Feature implementation

Multifrequency Compelled Signaling (MFC) tables are set up in Overlay 94 for incoming and outgoing signaling, as described in the following Overlay tables. To disable certain signals, assign the value of zero (0) to the respective signal name.

LD 94 – Configure MFC tables (Incoming table).

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	R2MF	R2/MFC table
ICOG	ICT	Incoming table
MAXT	(1) - 127	Maximum number of tables
TBNO	1 - 127	Table number to configure
EECD	1 - 127	End-to-end signaling code. EECD defaults to the TBNO table number when REQ = NEW. For a tandem Meridian 1 system, the incoming and outgoing R2/MFC Data Blocks should be configured with different values of EECD.
LVNO	1	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV		
XMIT	COMP 3	A.3 as MFC Complete signal
XMIT	SCNI 4	A.4 as Send CNI signal
XMIT	SCAT 5	A.5 as Send Category signal
LVNO	2	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV	<cr>	Stop RECV prompts
XMIT	IDLE 6	B.6 to be used as the IDLE signal

LD 94 – Configure MFC tables (Outgoing table).

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	R2MF	R2/MFC table
ICOG	OGT	Outgoing table
MAXT	(1) - 127	Maximum number of tables
TBNO	1 - 127	Table number to configure
...		
EECD	1 -127	End-to-end signaling code. EECD defaults to the TBNO table number when REQ = NEW. For a tandem Meridian 1 system, the incoming and outgoing R2/MFC Data Blocks should be configured with different values of EECD.
SCNT	YES	To allow processing of SCAT signal at any time during signaling exchange.
LVNO	1	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV	2 TFST	A.2 to be interpreted as Tandem First Signal (Restart)
RECV	3 COMP	A.3 as MFC Complete signal
RECV	4 SCNI	A.4 as Receive CNI signal
RECV	5 SCAT	A.5 as Receive Category signal
XMIT	<cr>	Stop XMIT prompts
LVNO	2	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV	6 IDLE	B.6 to be interpreted as IDLE

The MFC Sender/Receiver is configured in Overlay 13.

LD 13 – Set up MFC TNs.

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	MFC	Multifrequency Compelled Sender/Receiver data block. Multifrequency Compelled Signaling (MFC) package 128 is required.
TN	l s c u c u	Terminal Number (MFC) For Option 11C

R2/MFC signaling is configured on a route basis in Overlay 16.

LD 16 – Set up R2/MFC Route Data Block.

Prompt	Response	Description
REQ	CHG	Change existing data
TYPE	RDB	Route Data Block
CUST	xx	Customer number
ROUT	0-511 0-127	Route number For Option 11C
...		
SIGO	STD	Standard signaling arrangement
MFC	YES	Multifrequency Compelled (MFC) Signaling
INDMF	(NO) YES	Indian R2/MFC operations disabled Indian R2/MFC operations (enabled)
- CLEN	1-(10)-16	Select 10 CNI digits for Indian operations
MFCI	1-127	MFC Incoming table number configured in LD 94

...		
MFCO	1-127	MFC Outgoing table number configured in LD 94

R2MFC signaling is configured on a trunk basis in Overlay 14.

LD 14 – Configure trunk on the Route as MFC Trunk.

Prompt	Response	Description
REQ	CHG	Change existing data
TYPE	xxx	Trunk type (DID or TIE)
TN	l s c u c u	Terminal Number For Option 11C
CUST	xx	Customer number
NCOS	7	Network class of service
CLS	MFC CNA	Allow MFC class of service and Calling Number Identification

Feature operation

No specific operating procedures are required to use this feature.

Extended Flexible Central Office Trunk circuit card for India

Functional description

The NTCK18DA Extended Flexible Central Office Trunk card for India (XFCOT) provides the interface between the Meridian 1 system and up to eight analog Central Office (CO) trunks.

This XFCOT card for India provides an on-board 16 kHz Periodic Pulse Metering (PPM) pulse detector. The card has two B34 codec chips which are interconnected to the eight analog trunks with four quad filter codecs. In addition, Busy Tone Detection, Autoguard Fault Detection, and Reversal On Answer/Battery Supervision are supported by the NTCK18DA XFCOT card.

Common features

The NTCK18DA XFCOT card:

— supports loop start signaling

— allows trunk type to be configured on a per unit basis

— allows individual units or the entire card to be disabled by software or XPEC control

— provides software selectable A-law or μ-law operation

— supports analog to digital and digital to analog conversion for 8 audio paths

— indicates status during an automatic or manual self-test

— provides card identification for auto configuration, and for determining the serial number and firmware level of the card

- interfaces each of the eight PCM digital signals to one DS30X channel in A10 format
- transmits and receives SSD signaling messages over a DS30X signaling channel in A10 format
- supports PCM signal loopback to DS-30X for diagnostic purposes
- provides Termination and Transhybrid Balance Impedance to 600 ohms
- downloads transmit and receive losses to the B34 codec for operation over long and short lines
- provides internal detection and counting of 16 kHz Periodic Pulse Metering (PPM)
- provides direct reporting of Periodic Pulse Metering (PPM) pulses to software in either buffered or unbuffered format
- provides Autoguard Fault Detection to prevent a faulty trunk from being seized on an outgoing call
- supports Busy Tone Detection for disconnect supervision
- provides Reversal On Answer/Battery Supervision feature capabilities

Physical description

In Meridian 1 system Options 21, 21E, 51, 51C, 61, 61C, 71, 81 and 81C, the NTCK18DA XFCOT card may be installed in any of slots 0 through 15 of the NT8D37 cabinet. Those using Meridian 1 system Option 21 may install the card in slots 0 through 9 of the NT8D11 cabinet.

In Meridian 1 Option 11 systems, the NTCK18DA XFCOT card is installed in slots 1 through 10 of the NTAK11 main cabinet and in slots 11 through 20 in the NTAK12 expansion cabinet. In Option 11 systems equipped with Meridian Mail, the NTCK18DA XFCOT card cannot be installed in slot 10 of the main cabinet or slot 20 of the expansion cabinet.

Switch settings

There are no option settings on the NTCK18DA XFCOT card. All settings are configured in software.

Connections

The NTCK18DA XFCOT card has eight units. Each trunk unit on the card connects to the backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel, and the I/O panel is cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Hardware installation

Tables 3 to 6 provide cross connect information for the NTCK18DA XFCOT card.

Table 3
NTCK18DA XFCOT connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			A	E	K	R	
TO RO	26 1	W-BL BL-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 4
NTCK18DA XFCOT connections for NT8D37 I/O panel connectors B, F, L, S (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			B	F	L	S	
TO RO	26 1	W-BL BL-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 4
NTCK18DA XFCOT connections for NT8D37 I/O panel connectors B, F, L, S (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			B	F	L	S	
TO RO	42 17	Y-O O-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 1
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 2
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 3
	49 24	V-BR BR-V					

Table 5
NTCK18DA XFCOT connections for NT8D37 I/O panel connectors C, G, M, T (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			C	G	M	T	
T4 R4	26 1	W-BL BL-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 4
	27 2	W-O O-W					
T5 R5	28 3	W-G G-W					Unit 5
	29 4	W-BR BR-W					
T6 R6	30 5	W-S S-W					Unit 6
	31 6	R-BL BL-R					
T7 R7	32 7	R-O O-R					Unit 7
	33 8	R-G G-R					

Table 5
NTCK18DA XFCOT connections for NT8D37 I/O panel connectors C, G, M, T (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			C	G	M	T	
TO RO	34 9	R-BR BR-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
	35 10	R-S S-R					
T1 R1	36 11	BK-BL BL-BK					Unit 1
	37 12	BK-O O-BK					
T2 R2	38 13	BK-G G-BK					Unit 2
	39 14	BK-BR BR-BK					
T3 R3	40 15	BK-S S-BK					Unit 3
	41 16	Y-BL BL-Y					
T4 R4	42 17	Y-O O-Y					Unit 4
	43 18	Y-G G-Y					
T5 R5	44 19	Y-BR BR-Y					Unit 5
	45 20	Y-S S-Y					
T6 R6	46 21	V-BL BL-V					Unit 6
	47 22	V-O O-V					
T7 R7	48 23	V-G G-V					Unit 7
	49 24	V-BR BR-V					

Table 6
NTCK18DA XFCOT connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead	Pins	Pair color	Unit number
T0 R0	26 1	W-BL BL-W	Unit 0
	27 2	W-O O-W	
T1 R1	28 3	W-G G-W	Unit 1
	29 4	W-BR BR-W	
T2 R2	30 5	W-S S-W	Unit 2
	31 6	R-BL BL-R	
T3 R3	32 7	R-O O-R	Unit 3
	33 8	R-G G-R	
T4 R4	34 9	R-BR BR-R	Unit 4
	35 10	R-S S-R	
T5 R5	36 11	BK-BL BL-BK	Unit 5
	37 12	BK-O O-BK	
T6 R6	38 13	BK-G G-BK	Unit 6
	39 14	BK-BR BR-BK	
T7 R7	40 15	BK-S S-BK	Unit 7
	41 16	Y-BL BL-Y	

Self-test

When the card is installed, the red Light Emitting Diode (LED) on the faceplate flashes as the self-test runs. If the self-test completes successfully, the LED flashes three times and remains continuously lit until the card is automatically enabled (if it has been configured in software) after which the LED goes out. If the self-test fails, the LED will remain lit.

Trunk configuration

Route Data Block

Each trunk unit on the NTCK18DA XFCOT card is attached to a route with an associated Route Data Block. Periodic Pulse Metering (PPM) and trunk timers are configured on a route basis. The Route Data Block is programmed in overlay 16, as described in Table 7.

Table 7
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	Add a new data block to the system
TYPE	RDB	Define a new Route Data Block
CUST	xx	Enter customer number
ROUT	0–511 0-127	Enter route number For Option 11
TKTP	COT	Define trunk type as Central Office
ICOG	IAO	Incoming and Outgoing trunk
NEDC	ETH	Either end control
FEDC	ETH	Either end control
CDR	YES (NO)	Call Detail Recording allowed
MR	 (NO) PPM XLD	Message Registration The route is not metered Buffered PPM signals counted M and MM

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NTCK18DA XFCOT, as described in Table 8.

Table 8
LD 14 Trunk Data Block

Prompt	Response	Comments
REQ	NEW x	Define a new trunk unit, x is from 1–255
TYPE	COT	Central Office Trunk data block
TN	l s c u c u	Terminal number of the unit For Option 11
CDEN	8D	Card density is 8D (octal)
XTRK	XCOT	Type is IPE COT (This prompt is required only for the first unit, unit 0, defined on each card.)
SIGL	LOP	Loop Start signaling
TIMP	(600)	Termination impedance
BIMP	600 (3COM)	Balance impedance
SUPN	YES	Answer and disconnect supervision required
STYP	 BAT (XBAT) BTS (XBTS) BAT BTS	Supervision Type Battery Supervised COT Busy Tone Supervision Both Options
SEIZ	YES (NO)	Automatic Guard Detection for outgoing trunk
PPID	3	Periodic Pulse Metering (PPM) country ID. Set for 16 kHz. (This prompt is required only for the first unit, unit 0, defined on each card.)
BTID	11	Busy Tone country ID. Set for 750 ms On/Off. (This prompt is required only for the first unit, unit 0, defined on each card.)
CLS	(DIP) DTN	Dial Pulse Digitone

Technical description

Power requirements

Table 9 provides the power requirements for the NTCK18DA XFCOT card.

Table 9
NTCK18DA power requirements

V (volts)	I (mA) Idle	I (mA) Seize
+15V (Note 1)	150	300
-15V (Note 1)	150	300
+8.5V (Note 2)	80	80
+5V	200	500
-48V	50	50

Note 1: Analog circuitry is powered with +/- 12V generated from +/-15V. The maximum current imbalance between the +/-15V rails is 100 mA.

Note 2: 8.5V is regulated to provide 5V.

Environmental specifications

Table 10 provides the environmental specifications for the NTCK18DA XFCOT card.

Table 10
NTCK18DA environmental specifications

Parameter	Limit
Operating temperature	0 to +45 degrees C, ambient
Operating humidity	10 to 95% relative humidity
Storage temperature	-40 to +70 degrees C
Storage humidity	0 to 95% relative humidity

Transmission parameters

Loss values for the NTCK18DA XFCOT card are programmable on a per system basis. These loss values are fixed once programmed in LD 97 and LD 17. The values are not variable on a per call basis.

The insertion loss values are as follows:

- Loss A/D: -6.5 ± 0.5 dB
- Loss D/A: 0.5 ± 0.5 dB

Table 11 shows the pad code values required for programming the Indian loss plan. These values are derived from Table 12 which is a cross-reference guide for Relative Input/Output levels and their corresponding codes.

Table 13 describes the administration prompts used in overlay 97.

Table 11
Predefined Static Loss Plan Download tables (Part 1 of 2)

	India			
B34 Port Type	**Rx**	**dBr**	**Tx**	**dBr**
COTS	29	-6.5	17	-0.5
COTL	29	-6.5	17	-0.5
DIDS	30	-7.0	16	0.0
DIDL	30	-7.0	16	0.0
T2WT	23	-3.5	23	-3.5
T2WN	23	-3.5	23	-3.5
T2WV	23	-3.5	23	-3.5
T4WT	23	-3.5	23	-3.5
T4WN	23	-3.5	23	-3.5
- continued -				

Table 11
Predefined Static Loss Plan Download tables (Part 2 of 2)

	India			
B34 Port Type	**Rx**	**dBr**	**Tx**	**dBr**
T4WV	23	-3.5	23	-3.5
PAGT	---	---	23	-3.5
RANR	23	-3.5	---	---
ALUS	16	0.0	30	-7.0
ALUL	16	0.0	30	-7.0

Table 12
LD 97 code to Relative Input/Output Level cross-reference

		Lines		Trunks				Lines		Trunks	
Code	**Level (dBr)**	**Rx**	**Tx**	**Rx**	**Tx**	**Code**	**Level (dBr)**	**Rx**	**Tx**	**Rx**	**Tx**
0	8.0	√			√	20	- 2.0	√	√	√	√
1	7.5	√			√	21	- 2.5	√	√	√	√
2	7.0	√			√	22	- 3.0	√	√	√	√
3	6.5	√			√	23	- 3.5	√	√	√	√
4	6.0	√			√	24	- 4.0	√	√	√	√
5	5.5	√			√	25	- 4.5	√	√	√	√
6	5.0	√			√	26	- 5.0	√	√	√	√
7	4.5	√			√	27	- 5.5	√	√	√	√
8	4.0	√	√	√	√	28	- 6.0	√	√	√	√
9	3.5	√	√	√	√	29	- 6.5	√	√	√	√
10	3.0	√	√	√	√	30	- 7.0	√	√	√	√
11	2.5	√	√	√	√	31	- 7.5	√	√	√	√
12	2.0	√	√	√	√	32	- 8.0		√	√	
13	1.5	√	√	√	√	33	- 8.5		√	√	
14	1.0	√	√	√	√	34	- 9.0		√	√	
15	0.5	√	√	√	√	35	- 9.5		√	√	
16	0.0	√	√	√	√	36	- 10.0		√	√	
17	- 0.5	√	√	√	√	37	- 10.5		√	√	
18	- 1.0	√	√	√	√	38	- 11.0		√	√	
19	- 1.5	√	√	√	√	39	- 11.5		√	√	

Note: √ indicates a valid code for a line or a trunk in either Tx or Rx mode.

Table 13
LD 97 Static Loss Plan Downloading (SLPD) prompts and responses (Part 1 of 2)

Prompt	Response		Comment
REQ	CHG		Modify data block.
TYPE	LOSP		Loss Plan table creation or modification
NATP	(NO) YES		North American Transmission Plan Dynamic Pad Switching method (Dynamic Pad Switching is only supported on Generic XFCOT [NT5K16] packs.)
TTYP	STAT		Static Loss Plan table
-STYP	CSTM		Customized Static Loss Plan table (user will be prompted to input required PORT TYPE LI LO values)
The following is prompted when TTYP = STAT and STYP = CSTM			
PWD2			Level 2 Administrator password as defined in LD 17
COTS	Rx	Tx	COT short line
	29	17	Where: Rx = Relative Input/Output Level code for the Receive (A/D) direction Tx = Relative Input/Output Level code for the Transmit (D/A) direction
COTL	Rx	Tx	COT long line
	29	17	
DIDS	Rx	Tx	DID short line
	30	16	
DIDL	Rx	Tx	DID long line
	30	16	
T2WT	Rx	Tx	TIE 2-wire, CLS = TRC
	23	23	
T2WN	Rx	Tx	TIE 2-wire, CLS = NTC
	23	23	

Table 13
LD 97 Static Loss Plan Downloading (SLPD) prompts and responses (Part 2 of 2)

Prompt	Response		Comment
T2WV	Rx	Tx	TIE 2-wire, CLS = VNL
	23	23	
T4WT	Rx	Tx	TIE 4-wire, CLS = TRC
	23	23	
T4WN	Rx	Tx	TIE 4-wire, CLS = NTC
	23	23	
T4WV	Rx	Tx	TIE 4-wire, CLS = VNL
	23	23	
PAGT		Tx	Paging trunk
		23	
RANR	Rx		RAN trunk
	23		
ALUS	Rx	Tx	Analog Line Card unit CLS = SHL
	16	30	
ALUL	Rx	Tx	Analog Line Card unit CLS = LOL
	16	30	

Signalling and feature description

The NTCK18DA XFCOT card supports:

— Loop start operation

— Busy Tone Detection

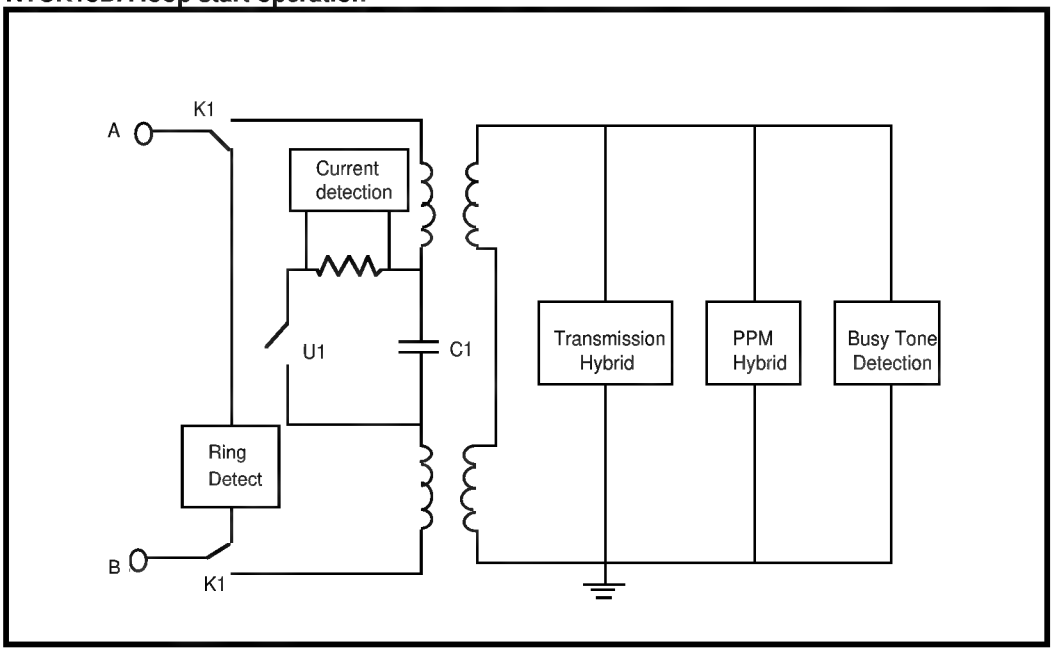
— Reversal On Answer/Battery Supervision

— Autoguard Fault Detection

Loop start operation

Loop start operation is configured in software and is implemented through software download messages. Figure 1 provides a block diagram of the front end of each trunk unit.

Figure 1
NTCK18DA loop start operation



Idle state

In the idle state the ringing detector is connected across the tip and ring leads (A and B wires) through the normally closed contacts of relay K1. The XFCOT presents a high impedance to the Central Office for isolation and DC detection.

Incoming Call

The Central Office indicates an incoming call by reversing battery. Ringing is applied between the tip and ring leads (A and B wires). Ringing signals that fall inside of the limits will be detected within 200 ms of application. If the call is answered, a seize message is sent to the trunk card software. Relay K1 switches out the card's ringing detector and places a low resistance DC loop between the tip and ring leads (A and B wires).

Outgoing Call

The Meridian 1 system originates a call by activating K1 and U1, which switch out the ringing detector and present a low impedance loop across the tip and ring leads (A and B wires). For Meridian 1 systems, it is necessary to first check that the exchange battery exceeds 40V DC. The Meridian 1 sends address information to the Central Office in the form of loop disconnect pulses or Dual Tone Multifrequency (DTMF) signals.

Seizure acknowledge

This feature is configured on a unit basis and is called Autoguard Fault Detection. It will prevent the loop-start trunk from being seized for outgoing traffic if loop current is not detected. Normally software will receive a seizure acknowledge message, if not, then a software timer will hold the unit busy and another trunk in the Route Data Block will be seized. The XFCOT will still accept incoming calls.

Far end release

If Busy Tone Detection is configured, then on receipt of a busy tone signal from the far end the XFCOT will send a disconnect message to software. The software will distinguish between near end and far end busy tone.

Near end release

The Meridian 1 system disconnects a call by opening relays U1 and K1, and re-inserting the ringing detector across the tip and ring leads (A and B wires). If the trunk is configured for PPM detection there will be a delay between K1 and U1. The low impedance path remains for 0.8 seconds for PPM detection, then relay K1 times out, breaking the DC loop and re-connecting the ringing detector. If an incoming call is released, or if PPM is not configured, then U1 and K1 will switch simultaneously. When the ringing detector is switched in, a high impedance loop is presented to the public exchange.

Features description

Periodic Pulse Metering (PPM)

All trunk units on the NTCK18DA card can be individually configured to support the Periodic Pulse Metering (PPM) feature. The NTCK18DA XFCOT card has an on-board 16 kHz PPM detector.

Periodic Pulse Metering allows the user of a telephone on a Meridian 1 system to keep an accurate record of public exchange calls for billing or administration purposes.

For more information on PPM, refer to the *Software Feature Guide*.

Autoguard Fault Detection

The NTCK18DA XFCOT card detects the following line faults:

i) An open circuit in one or both legs or,

ii) An open circuit voltage of less than 40 Volt DC.

If either of these faults is detected during an outgoing seize, the trunk is released and the next trunk in the hunt chain is seized. The faulty trunk is then barred from outgoing calls for 200 seconds.

Reversal On Answer

The Reversal On Answer feature allows call metering when the NTCK18DA XFCOT is connected to a CO that does not provide 16 kHz metering pulses.

On an outgoing call, the XFCOT detects battery reversal by the CO on a far end answer within 90 ms of the last digit being transmitted. When the far end is released, the unit will detect the CO reversal of battery to the normal state within 2 seconds. When the near end is released, the unit will immediately idle the trunk without waiting for confirmation from the CO in the form of a polarity change to the normal state.

Busy Tone Disconnect Supervision

Busy Tone Detection (Busy Tone Disconnect Supervision) is applied on a per channel basis. This feature uses two tone detectors which monitor the input and the output of the codec. Busy tone is detected within a bandwidth of 350 to 500 Hz and to a minimum level of -30 dBm. The cadence is 750 ms ON and 750 ms OFF with tolerance of ±50 ms. When the busy tone is detected by the tone detector, the tone burst cadences are presented to the Intel 87C52 microcontroller in TTL logic level. The microcontroller checks the validity of the cadence before reporting to the Meridian 1 system CPU.

Busy Tone Detection should operate correctly in the presence of Ringback Tone from the Central Office Trunk.

Universal Central Office Trunk circuit card for India

Functional description

The NT5D29AA Universal Central Office Trunk card for India (XCOTI) with Busy Tone Disconnect Supervision provides the interface between the Meridian 1 system and up to eight analog Central Office (CO) trunks.

The XCOTI card has two B34 codec chips which are interfaced to the eight analog trunks. This card provides Busy Tone Disconnect Supervision within a frequency bandwidth of 400±25 Hz, as well as Reverse Battery Disconnect Supervision.

Common features

The NT5D29AA XCOTI card:

— supports loop start signaling

— allows individual units or the entire card to be disabled by software or XPEC control

— provides software selectable A-law or μ-law operation

— supports analog to digital and digital to analog conversion for 8 audio paths with fixed loss levels in accordance with the Indian loss level plan

— indicates status during an automatic or manual self-test

— provides card identification for auto configuration, and for determining the serial number and firmware level of the card

— interfaces each of the eight PCM digital signals to one DS30X channel in A10 format

- transmits and receives SSD signaling messages over a DS30X signaling channel in A10 format
- supports PCM signal loopback to DS-30X for diagnostic purposes
- provides 600 ohms Termination Impedance
- provides 600 ohms or 3COM software selectable Transhybrid Balance Impedance
- for loaded cable long loops, a hardware strap provides an additional 3CM2 Balance Impedance
- provides fixed transmit and receive losses; A/D = -6.5 dB, D/A = 0.5 dB
- provides digit collection under software control
- supports on-board outpulsing through a software downloadable make break ratio
- supports Busy Tone Disconnect Supervision feature with a software selectable cadence of ON/OFF timing in 25 ms increments
- supports Reverse Battery Disconnect Supervision feature

Physical description

In Meridian 1 system Options 21, 21E, 51, 51C, 61, 61C, 71, 81 and 81C, the NT5D29AA XCOTI card may be installed in any of slots 0 through 15 of the NT8D37 cabinet. Those using Meridian 1 system Options 21 or 21E may install the card in slots 0 through 9 of the NT8D11 cabinet.

In Meridian 1 Option 11 systems, the NT5D29AA XCOTI card is installed in slots 1 through 10 of the NTAK11 main cabinet and in slots 11 through 20 in the NTAK12 expansion cabinet. In Option 11 systems equipped with Meridian Mail, the NT5D29AA XCOTI card cannot be installed in slot 10 of the main cabinet or slot 20 of the expansion cabinet.

Jumper strap settings

The jumper straps for the XCOTI card should be set to the configurations described in Table 14. For loops using loaded cable or loops exceeding 1524 meters (5000 ft), the fourth jumper strap will provide an additional 3CM2 balance impedance.

Figure 2 shows the jumper strap locations on the NT5D29AA XCOTI card.

Service change entries

Trunk type, terminating impedance, and balance network are selected by service change entries in the Trunk Administration program (LD 14). Refer to Table 15 to select the proper values for the trunk type and loop length being employed. Refer to the Meridian 1 *X11 input/output guide* for LD 14 service change instructions.

Table 14
Jumper strap settings (NT5D29AA)

Trunk type	Loop length	Jumper strap settings			
		J1.X	J2.X	J3.X	J4.X
CO	0 - 762 m (0 - 2500 ft)	Off	Off	1-2	1-2 600Ω
	>762 m (2500 ft)	Off	Off	1-2	1-2 3COM
	>1524 m (5000 ft) Loaded Cable	Off	Off	1-2	2-3 3CM2

Note: Jumper strap settings J1.X, J2.X, J3.X, and J4.X apply to all eight units; "X" indicates the unit number, 0–7. "Off" indicates that no jumper strap is installed on a jumper block. Store unused straps on the XCOTI card by installing them on a single jumper pin as shown below:

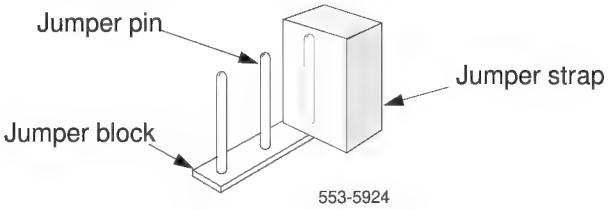


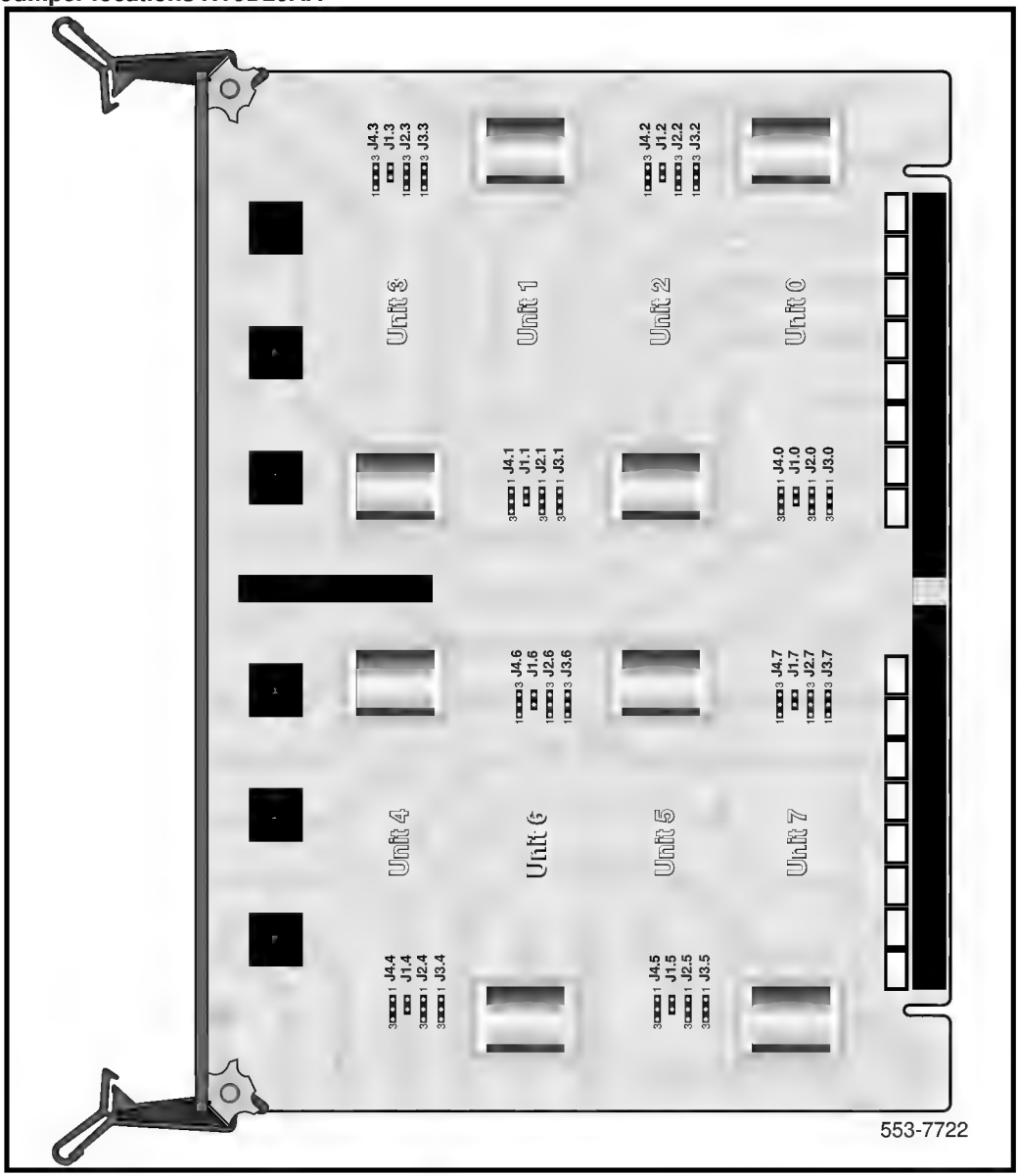
Table 15
Trunk type - termination impedance and balance network (NT5D29AA)

Trunk type	Terminating impedance (Note 1)	Balance network for loop lengths (Note 2)		
		Zero – 762 m (zero – 2500ft)	> 762 m (>2500 ft)	For Loaded Cable
CO	600 Ω	600 Ω	3COM	3CM2

Note 1: The terminating impedance of each trunk unit is software selectable in LD 14 and should match the nominal impedance of the connecting equipment.

Note 2: The balance network of each trunk unit is software selectable between resistive 600 ohms, 3COM or 3CM2. 3COM and 3CM2 balance network options are provided by jumper setting (J4.X). See Table 14.

Figure 2
Jumper locations NT5D29AA



Connections

The NT5D29AA XCOTI card connects to the backplane through a 160-pin connector shroud. The backplane is cabled to the input/output (I/O) panel, which is cabled to the Main Distribution Frame (MDF) by 25-pair cables. External equipment, such as Recorded Announcement machines, Paging equipment, and Central Office facilities, connect to the card at the MDF.

Hardware installation

Tables 16 to 19 provide cross connect information for the NT5D29AA XCOTI card.

Table 16
NT5D29AA XCOTI connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			A	E	K	R	
TO RO	26 1	W-BL BL-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 17
NT5D29AA XCOTI connections for NT8D37 I/O panel connectors B, F, L, S (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			B	F	L	S	
TO RO	26 1	W-BL BL-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 17
NT5D29AA XCOTI connections for NT8D37 I/O panel connectors B, F, L, S (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			B	F	L	S	
TO RO	42 17	Y-O O-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 1
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 2
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 3
	49 24	V-BR BR-V					

Table 18
NT5D29AA XCOTI connections for NT8D37 I/O panel connectors C, G, M, T (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			C	G	M	T	
T4 R4	26 1	W-BL BL-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 4
	27 2	W-O O-W					
T5 R5	28 3	W-G G-W					Unit 5
	29 4	W-BR BR-W					
T6 R6	30 5	W-S S-W					Unit 6
	31 6	R-BL BL-R					
T7 R7	32 7	R-O O-R					Unit 7
	33 8	R-G G-R					

Table 18
NT5D29AA XCOTI connections for NT8D37 I/O panel connectors C, G, M, T (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			C	G	M	T	
TO RO	34 9	R-BR BR-R					Unit 0
	35 10	R-S S-R					
T1 R1	36 11	BK-BL BL-BK					Unit 1
	37 12	BK-O O-BK					
T2 R2	38 13	BK-G G-BK					Unit 2
	39 14	BK-BR BR-BK					
T3 R3	40 15	BK-S S-BK					Unit 3
	41 16	Y-BL BL-Y					
T4 R4	42 17	Y-O O-Y	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 4
	43 18	Y-G G-Y					
T5 R5	44 19	Y-BR BR-Y					Unit 5
	45 20	Y-S S-Y					
T6 R6	46 21	V-BL BL-V					Unit 6
	47 22	V-O O-V					
T7 R7	48 23	V-G G-V					Unit 7
	49 24	V-BR BR-V					

Table 19
NT5D29AA XCOTI connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead	Pins	Pair color	Unit number
T0 R0	26 1	W-BL BL-W	Unit 0
	27 2	W-O O-W	
T1 R1	28 3	W-G G-W	Unit 1
	29 4	W-BR BR-W	
T2 R2	30 5	W-S S-W	Unit 2
	31 6	R-BL BL-R	
T3 R3	32 7	R-O O-R	Unit 3
	33 8	R-G G-R	
T4 R4	34 9	R-BR BR-R	Unit 4
	35 10	R-S S-R	
T5 R5	36 11	BK-BL BL-BK	Unit 5
	37 12	BK-O O-BK	
T6 R6	38 13	BK-G G-BK	Unit 6
	39 14	BK-BR BR-BK	
T7 R7	40 15	BK-S S-BK	Unit 7
	41 16	Y-BL BL-Y	

Self-test

When the card is installed, the red Light Emitting Diode (LED) on the faceplate flashes as the self-test runs. If the self-test completes successfully, the LED flashes three times and remains continuously lit until the card is automatically enabled (if it has been configured in software) after which the LED goes out. If the self-test fails, the LED will remain lit.

Trunk configuration

Busy Tone Detection (BTD) Data Block

Busy Tone Detection is configured in overlay 97, as described in Table 20.

Table 20
LD 97 Busy Tone Detection Data Block

Prompt	Response	Comments
REQ	CHG	Modify existing data
TYPE	BTD	Busy Tone Detection
BTDT	(0)-7	Busy Tone Detection Table 0
BCAD	(350) (350)	Busy Tone Cadence (ON and OFF cycles) in milliseconds
	750 750	For India
BTDD	(BOTH)	Busy Tone Detection on both incoming and outgoing calls
	INC	Busy Tone Detection on incoming calls only

Route Data Block

Each trunk unit on the NT5D29AA XCOTI card is attached to a route with an associated Route Data Block. Trunk timers are configured on a route basis. The Route Data Block is programmed in overlay 16, as described in Table 21.

Table 21
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	Add a new data block to the system
TYPE	RDB	Define a new Route Data Block
CUST	xx	Enter customer number
ROUT	0–511 0-127	Enter route number For Option 11
TKTP	COT	Define trunk type as Central Office
ICOG	IAO	Incoming and Outgoing trunk
CNTL	YES	Changes to controls or timers
NEDC	ETH	Either end control
FEDC	ETH	Either end control

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NT5D29AA XCOTI, as described in Table 22.

Table 22
LD 14 Trunk Data Block

Prompt	Response	Comments
REQ	NEW	Define a new trunk unit
TYPE	COT	Central Office Trunk data block
TN	l s c u c u	Terminal number of the unit For Option 11
XTRK	EXUT	Type is IPE EXUT (This prompt is required only for the first unit, unit 0, defined on each card.)
SIGL	LOP	Loop Start signaling
TIMP	600	Termination impedance
BIMP	600 (3COM)	Balance impedance
SUPN	YES	Answer and disconnect supervision required
- STYP	 PIP BTS PIP BTS	Supervision Type Polarity Insensitive Pack Busy Tone Supervision Both options
BTDT	(0)-7	Busy Tone Detection Table (This prompt is required only for the first unit, unit 0, defined on each card.)
CLS	(DIP) DTN	Dial Pulse Digitone

Technical description

Electrical specifications

Table 23 gives the electrical characteristics of the XCOTI card.

Table 23
Electrical characteristics for the NT5D29AA

Characteristic	XCOTI
Terminal impedance	600 Ω
Balance impedance	600 Ω (Note 1) 3COM or 3CM2 (Note 2)
Supervision type	Loop start (with answer supervision) (Note 3)
Busy Tone level required for disconnect supervision	- 25 dBm
DC signaling loop length (max)	1700 Ω loop with near-end battery of – 42.75 V
Far-end battery	– 42 to – 52.5 V (Note 4)
Minimum detected loop current	10 mA
Ground potential difference	±3 V
Low DC loop resistance during outpulsing	<300 Ω
High DC loop resistance	≥ 5M Ω
Ring detection	17 to 33 Hz 40 to 120 V rms
Line leakage	≥ 30k Ω, tip-to-ring, tip-to-ground, ring-to-ground
AC induction rejection	10 V rms, tip-to-ring, tip-to-ground, ring-to-ground

Note 1: Selected in software.

Note 2: Selected by jumper strap settings on card and in software.

Note 3: Loop start with Busy Tone Disconnect Supervision introduced with minimum Release 21 software.

Note 4: For loop extender application, the maximum voltage applied between tip and ring is –105 V ±5%. The minimum DC loop resistance for this type of application is 1800 ohms.

Power requirements

Table 24 provides the power requirements for the NT5D29AA XCOTI card.

Table 24
NT5D29AA power requirements

V (volts)	I (mA) Idle	I (mA) Seize
±15V (Note 1)	350	350
+8.5V (Note 2)	450	450
-48V	346	411

Note 1: Analog circuitry is powered with +/- 12V generated from +/- 15V. The maximum current imbalance between the +/-15V rails is 100 mA.

Note 2: 8.5V is regulated to provide 5V.

Environmental specifications

Table 25 provides the environmental specifications for the NT5D29AA XCOTI card.

Table 25
NT5D29AA environmental specifications

Parameter	Limit
Operating temperature	0 to +45 degrees C, ambient
Operating humidity	20 to 95% relative humidity
Storage temperature	-20 to +60 degrees C
Storage humidity	5 to 95% relative humidity

Transmission parameters

The NT5D29AA XCOTI card provides fixed loss in both the analog to digital and digital to analog directions.

The insertion loss values are as follows:

— Loss A/D: -6.5 ± 0.5 dB

— Loss D/A: 0.5 ± 0.5 dB

Signalling and feature description

The NT5D29AA XCOTI card supports:

— Loop start operation

— Busy Tone Detection

— Reverse Battery Supervision Detection

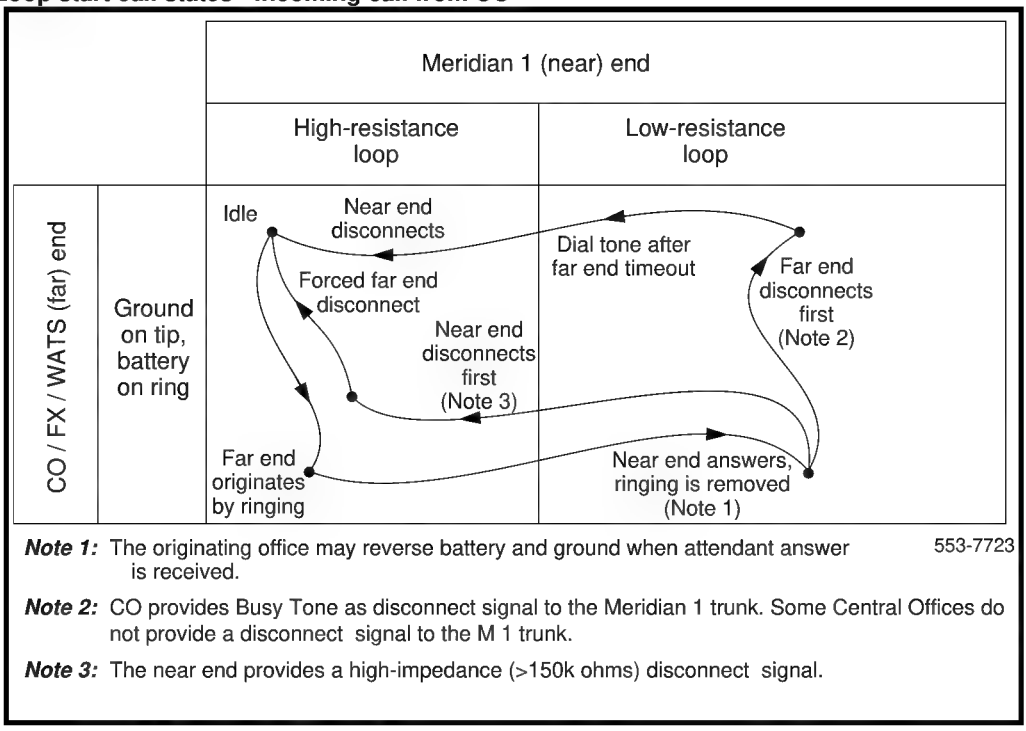
Loop start operation

Loop start operation is configured in software and is implemented through software download messages. When the XCOTI card is idle, it provides a high impedance toward the CO for isolation and AC detection.

Incoming call

The CO sends an alerting signal of 25 Hz to the Meridian 1 system. Ringing is tripped when this trunk circuit places a low resistance DC loop towards the CO when an attendant is available. Figures 3 and 4 describe this process.

Figure 3
Loop start call states - incoming call from CO

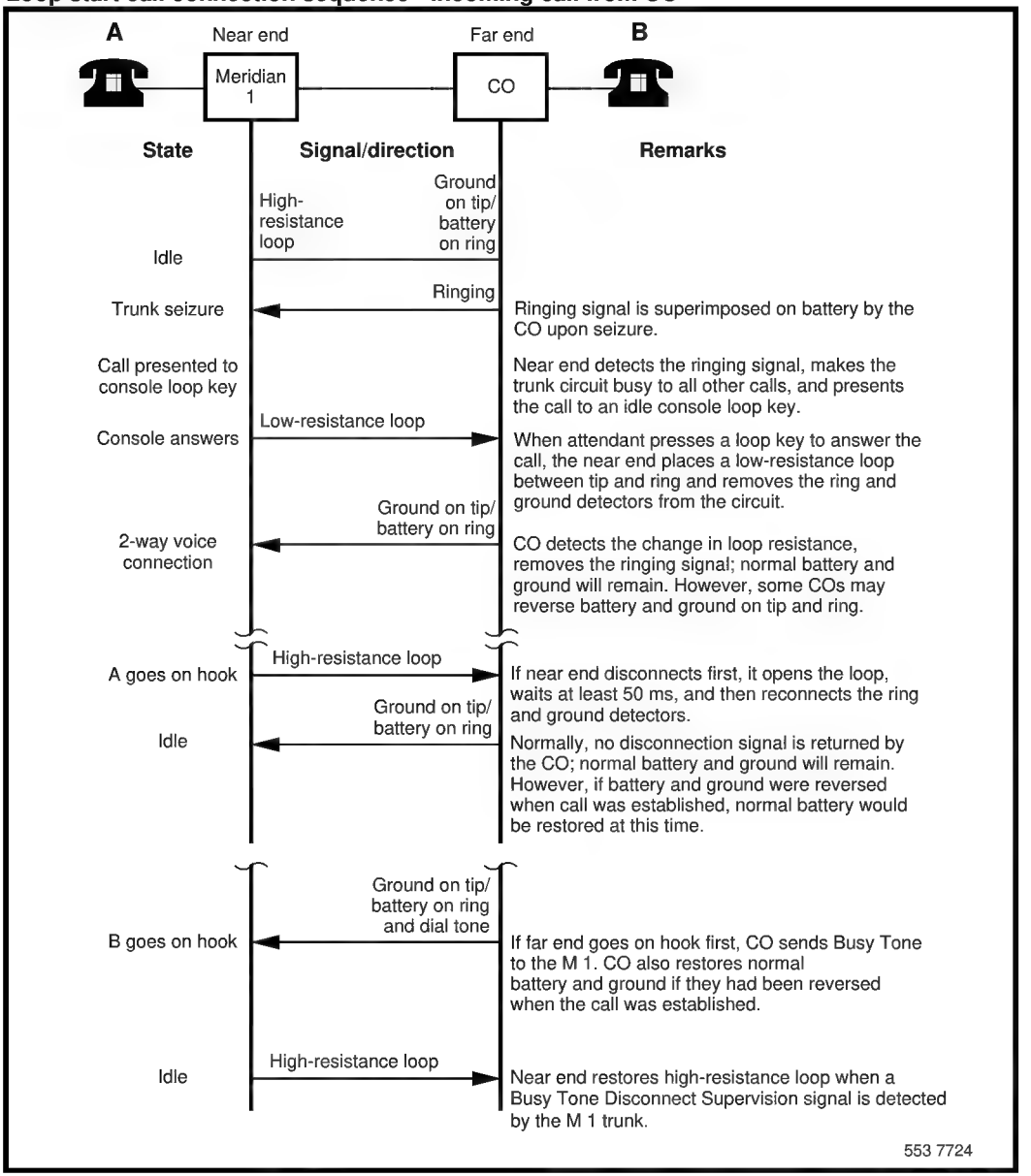

Meridian 1 (near) end
High-resistance loop
Low-resistance loop
CO / FX / WATS (far) end
Ground on tip, battery on ring
Idle
Near end disconnects
Forced far end disconnect
Near end disconnects first (Note 3)
Far end originates by ringing
Dial tone after far end timeout
Far end disconnects first (Note 2)
Near end answers, ringing is removed (Note 1)
553-7723

Note 1: The originating office may reverse battery and ground when attendant answer is received.

Note 2: CO provides Busy Tone as disconnect signal to the Meridian 1 trunk. Some Central Offices do not provide a disconnect signal to the M 1 trunk.

Note 3: The near end provides a high-impedance (>150k ohms) disconnect signal.

Figure 4
Loop start call connection sequence - incoming call from CO


A
Near end
Meridian 1
Far end
CO
B
State
Signal/direction
Remarks
High-resistance loop
Ground on tip/ battery on ring
Idle
Ringing
Trunk seizure
Ringing signal is superimposed on battery by the CO upon seizure.
Call presented to console loop key
Near end detects the ringing signal, makes the trunk circuit busy to all other calls, and presents the call to an idle console loop key.
Low-resistance loop
Console answers
When attendant presses a loop key to answer the call, the near end places a low-resistance loop between tip and ring and removes the ring and ground detectors from the circuit.
Ground on tip/ battery on ring
2-way voice connection
CO detects the change in loop resistance, removes the ringing signal; normal battery and ground will remain. However, some COs may reverse battery and ground on tip and ring.
High-resistance loop
A goes on hook
If near end disconnects first, it opens the loop, waits at least 50 ms, and then reconnects the ring and ground detectors.
Ground on tip/ battery on ring
Idle
Normally, no disconnection signal is returned by the CO; normal battery and ground will remain. However, if battery and ground were reversed when call was established, normal battery would be restored at this time.
Ground on tip/ battery on ring and dial tone
B goes on hook
If far end goes on hook first, CO sends Busy Tone to the M 1. CO also restores normal battery and ground if they had been reversed when the call was established.
High-resistance loop
Idle
Near end restores high-resistance loop when a Busy Tone Disconnect Supervision signal is detected by the M 1 trunk.
553 7724

Outgoing call

For outgoing calls from the Meridian 1 system, software sends an outgoing seizure message which places a low-resistance loop across the tip and ring leads towards the CO. When the CO detects the low-resistance loop, it prepares to receive digits. The CO returns dial tone when it is ready to receive digits. Outward address signaling is then applied from the Meridian 1 system in the form of loop (interrupting) dial pulses or DTMF tones. Figures 5 and 6 describe this process.

Figure 5
Loop start call states - outgoing call to CO

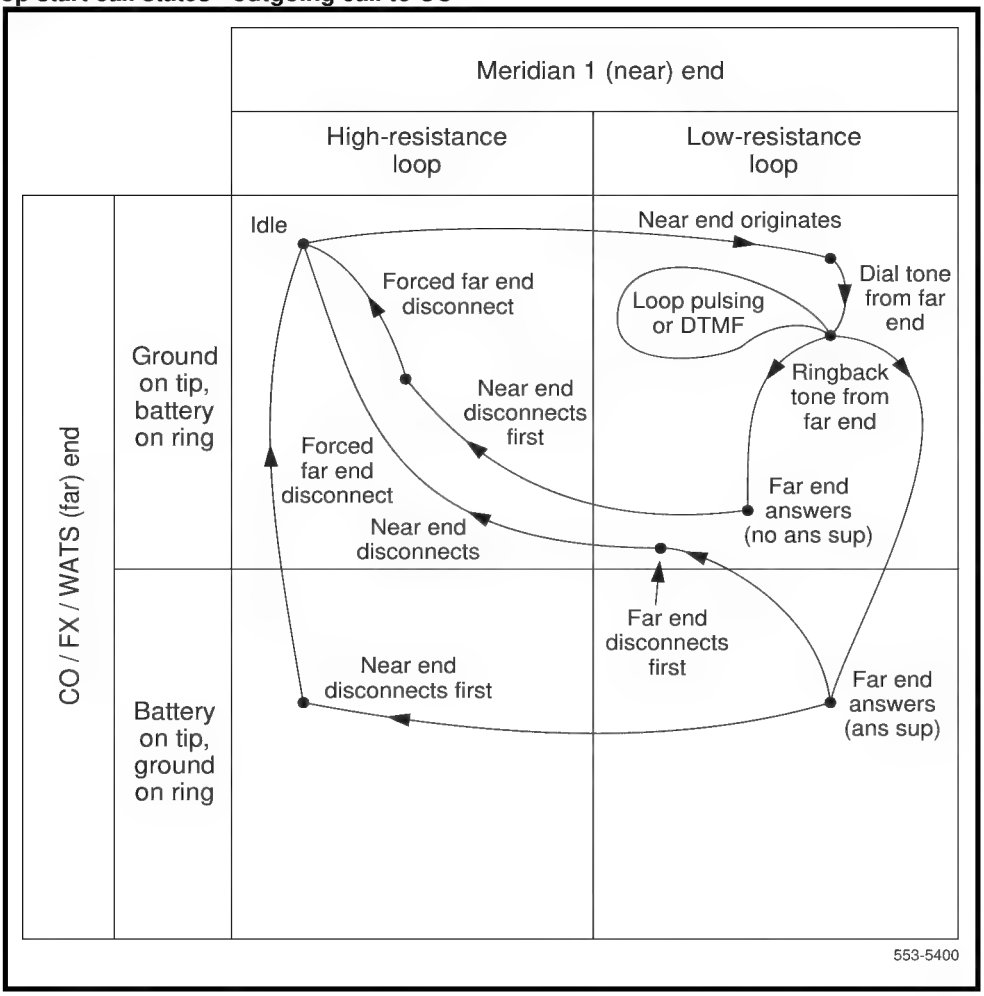
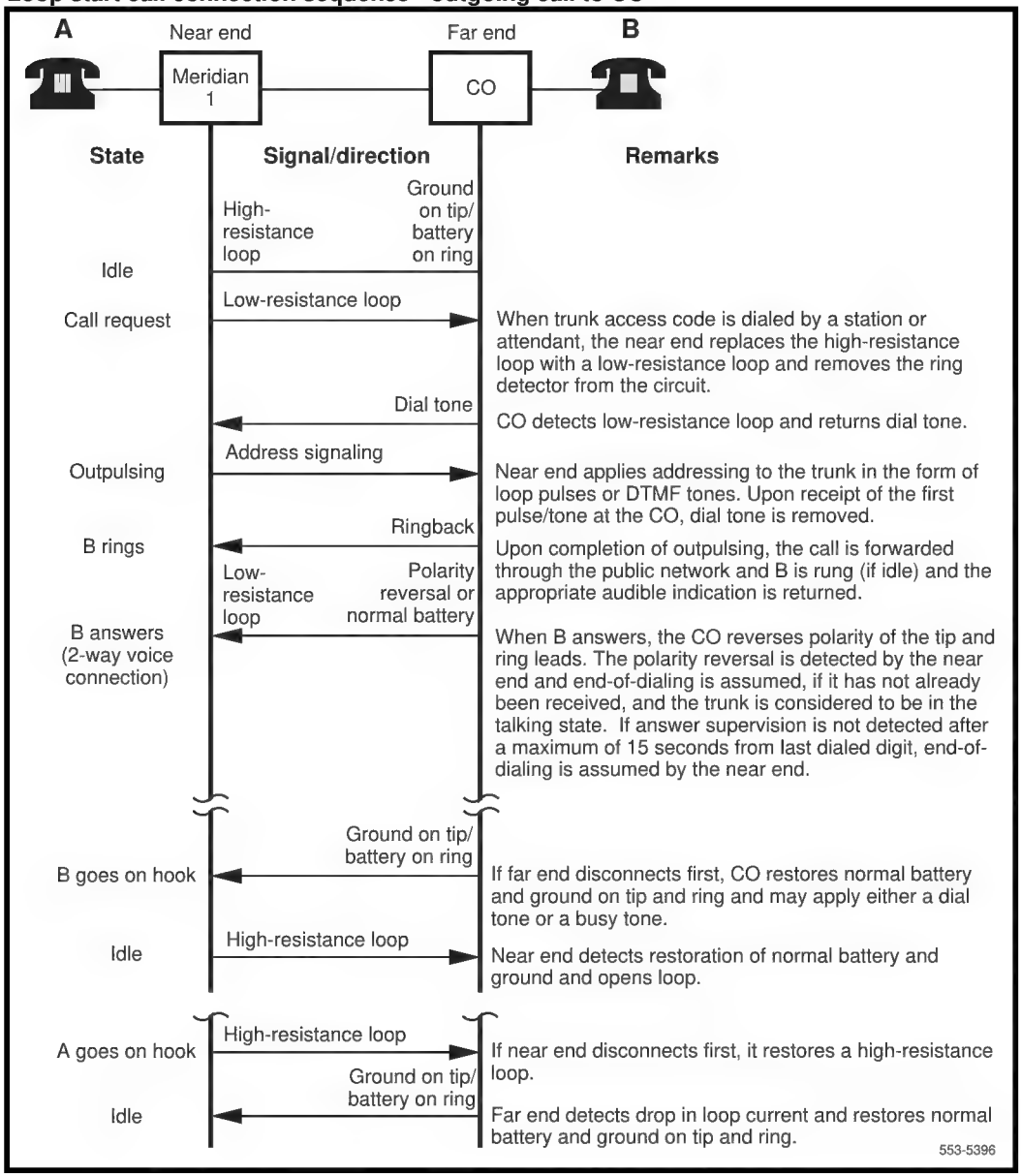

Meridian 1 (near) end
High-resistance loop
Low-resistance loop
CO / FX / WATS (far) end
Ground on tip, battery on ring
Battery on tip, ground on ring
Idle
Near end originates
Dial tone from far end
Loop pulsing or DTMF
Ringback tone from far end
Forced far end disconnect
Near end disconnects first
Forced far end disconnect
Near end disconnects
Far end answers (no ans sup)
Far end disconnects first
Near end disconnects first
Far end answers (ans sup)
553-5400

Figure 6
Loop start call connection sequence - outgoing call to CO


A
Near end
Meridian 1
Far end
CO
B
State
Signal/direction
Remarks
Idle
High-resistance loop
Ground on tip/ battery on ring
Call request
Low-resistance loop
When trunk access code is dialed by a station or attendant, the near end replaces the high-resistance loop with a low-resistance loop and removes the ring detector from the circuit.
Dial tone
CO detects low-resistance loop and returns dial tone.
Outpulsing
Address signaling
Near end applies addressing to the trunk in the form of loop pulses or DTMF tones. Upon receipt of the first pulse/tone at the CO, dial tone is removed.
B rings
Ringback
Upon completion of outpulsing, the call is forwarded through the public network and B is rung (if idle) and the appropriate audible indication is returned.
B answers (2-way voice connection)
Low-resistance loop
Polarity reversal or normal battery
When B answers, the CO reverses polarity of the tip and ring leads. The polarity reversal is detected by the near end and end-of-dialing is assumed, if it has not already been received, and the trunk is considered to be in the talking state. If answer supervision is not detected after a maximum of 15 seconds from last dialed digit, end-of-dialing is assumed by the near end.
B goes on hook
Ground on tip/ battery on ring
If far end disconnects first, CO restores normal battery and ground on tip and ring and may apply either a dial tone or a busy tone.
Idle
High-resistance loop
Near end detects restoration of normal battery and ground and opens loop.
A goes on hook
High-resistance loop
If near end disconnects first, it restores a high-resistance loop.
Idle
Ground on tip/ battery on ring
Far end detects drop in loop current and restores normal battery and ground on tip and ring.
553-5396

Far end release

If Busy Tone Detection is configured, upon receipt of a busy tone signal from the far end the XCOTI will send a busy tone detected message to software. Software will then send a disconnect message to idle the trunk.

Features description

Busy Tone Disconnect Supervision

This feature is supported with minimum Release 21 software and requires the Busy Tone Detection (BTD) software package 294. The NT5D29AA XCOTI card can be configured to support

— Busy Tone Disconnect Supervision for incoming calls only

— Busy Tone Disconnect Supervision for both incoming and outgoing calls

Busy Tone Detection (Busy Tone Disconnect Supervision) can be applied on a per channel basis. This feature uses a tone detector which monitors the input of the codec. Busy tone is detected within a bandwidth of 375 to 425 Hz and to a minimum level of -25 dBm. The cadence is 750 ms ON and 750 ms OFF with tolerance of ±100 ms for the Indian CO. The ON/OFF cadence timing is software selectable in 25 ms increments. When the busy tone is detected by the tone detector, the tone burst cadences are presented to the Intel 83C51FA microcontroller in TTL logic level. The microcontroller checks the validity of the cadence before reporting to the Meridian 1 system CPU.

Busy Tone Disconnect Supervision resolves the supervision problem that occurs when the Meridian 1 system receives calls from an unsupervised Loop Start Trunk. When these incoming calls are connected to a device such as Meridian Mail, and are subsequently disconnected, the Meridian 1 system is not informed and the trunk is held up unnecessarily. Busy Tone Disconnect Supervision provides busy tone detection which notifies the Meridian 1 system that the other end has disconnected and the Meridian 1 trunk is restored to an idle state.

DID trunk circuit card for India

Functional description

The NT5D28AA Universal Direct Inward Dialing trunk card for India (XDIDI) provides the interface between the Meridian 1 system and up to eight analog Central Office (CO) trunks.

The XDIDI card has two B34 codec chips which are interfaced to the eight analog trunks. The card also provides Reversal On Answer/Battery Supervision.

Common features

The NT5D28AA XDIDI card:

— supports Direct Inward Dialing operation

— allows individual units or the entire card to be disabled by software or XPEC control

— provides software selectable A-law or μ-law operation

— supports analog to digital and digital to analog conversion for 8 audio paths with fixed loss levels in accordance with the Indian loss level plan

— indicates status during an automatic or manual self-test

— provides card identification for auto configuration, and for determining the serial number and firmware level of the card

— interfaces each of the eight PCM digital signals to one DS30X channel in A10 format

— transmits and receives SSD signaling messages over a DS30X signaling channel in A10 format

— provides 600 ohms Termination Impedance

- provides 600 ohms or 3COM Transhybrid Balance Impedance
- for long loops or loaded cable, a hardware strap provides an additional 3CM2 Balance Impedance
- provides fixed transmit and receive losses; A/D = -7.0 dB, D/A = 0.0 dB
- provides digit collection under software control
- supports on-board outpulsing, the make/break ratio will be software downloadable in the initial configuration stage
- provides Battery Reversal to CO for Answer Supervision

Physical description

In Meridian 1 system Options 21, 21E, 51, 51C, 61, 61C, 71, 81 and 81C, the NT5D28AA XDIDI card may be installed in any of slots 0 through 15 of the NT8D37 cabinet. Those using Meridian 1 system Options 21 and 21E may install the card in slots 0 through 9 of the NT8D11 cabinet.

In Meridian 1 Option 11 systems, the NT5D28AA XDIDI card is installed in slots 1 through 10 of the NTAK11 main cabinet and in slots 11 through 20 in the NTAK12 expansion cabinet. In Option 11 systems equipped with Meridian Mail, the NT5D28AA XDIDI card cannot be installed in slot 10 of the main cabinet or slot 20 of the expansion cabinet.

Jumper strap settings

The jumper straps for the NT5D28AA XDIDI card should be set to the configurations described in Table 26. For loops using loaded cable which exceed 1524 meters (5000 ft), the fourth jumper strap will provide an additional 3CM2 Balance Impedance.

Figure 7 shows the jumper strap locations on the NT5D28AA XDIDI card.

Figure 7
Jumper locations NT5D28AA

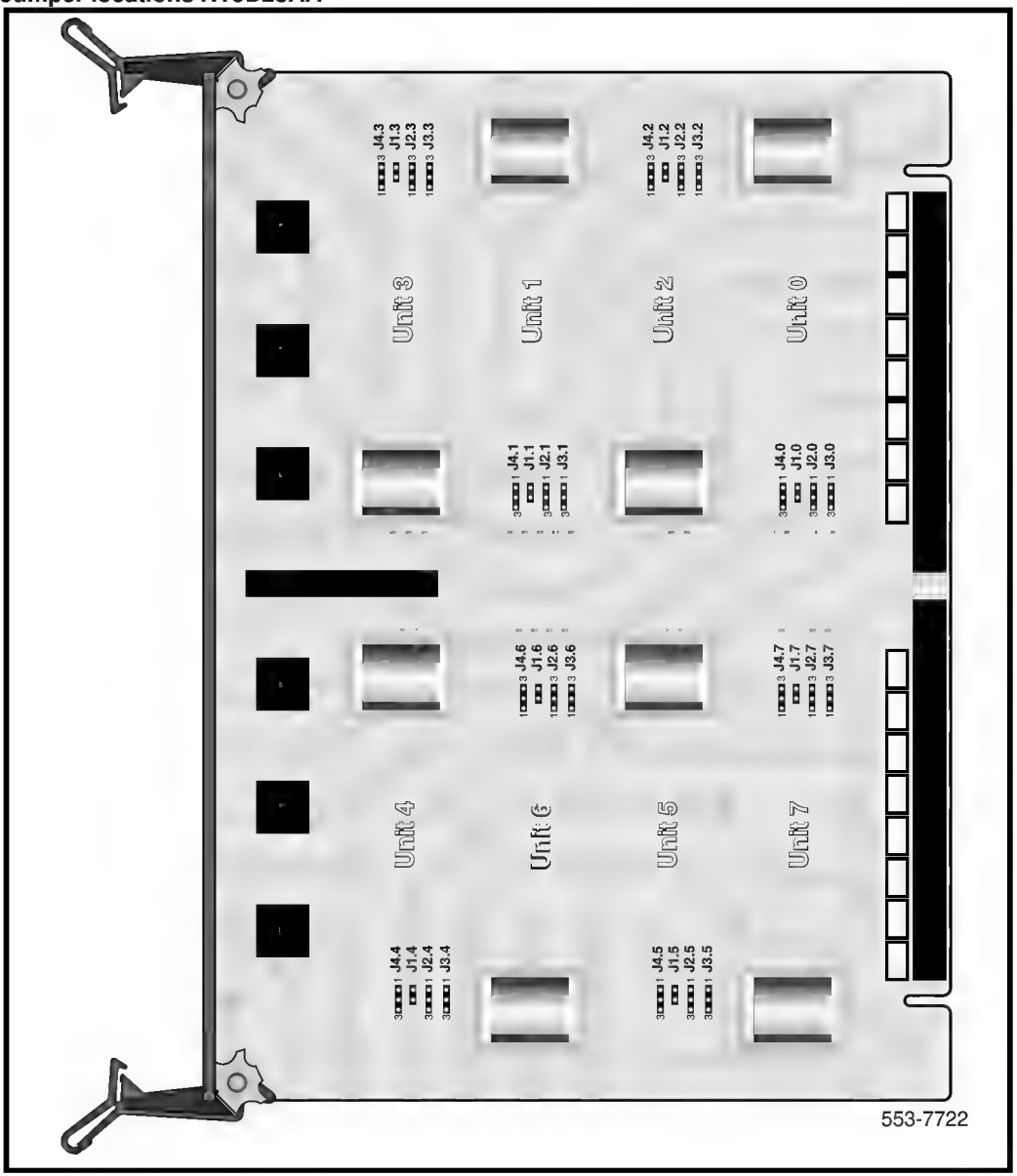


Table 26
Jumper strap settings (NT5D28AA)

Trunk type	Loop length	Jumper strap settings			
		J1.X	J2.X	J3.X	J4.X
DID <600 Ω	0 – 762 m (0 – 2500 ft)	Off	Off	1-2	1-2 600 Ω
	> 762 m (2500 ft)	Off	Off	1-2	1-2 3COM
	> 1524 m (5000 ft) Loaded Cable	Off	Off	1-2	2-3 3CM2
DID ≥600 Ω	0 – 762 m (0 – 2500 ft)	On	On	1-2	1-2 600 Ω
	>762 m (2500 ft)	On	On	1-2	1-2 3COM
	> 1524 m (5000 ft)	On	On	1-2	2-3 3CM2

Note: Jumper strap settings J1.X, J2.X, J3.X, and J4.X apply to all eight units; "X" indicates the unit number, 0–7. "Off" indicates that no jumper strap is installed on a jumper block. Store unused straps on the XDIDI card by installing them on a single jumper pin as shown below:

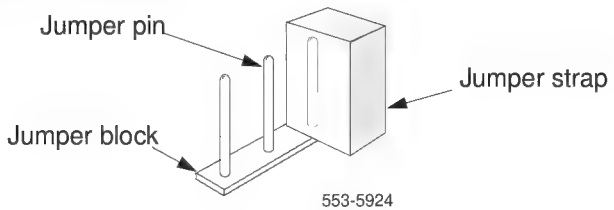


Table 27
Trunk types - termination impedance and balance network (NT5D28AA)

Trunk type	Terminating impedance (Note 1)	Balance network for loop lengths (Note 2)		
		0 – 762 m (0 – 2500 ft)	> 762 m (>2500 ft)	For loaded cable/loop lengths >1524 m (5000 ft)
DID (loop < 600 Ω)	600 Ω	600 Ω	3COM	3CM2
DID (loop ≥ 600 Ω)	600 Ω	600 Ω	3COM	3CM2

Note 1: The terminating impedance of each trunk unit is software selectable in LD 14 and should match the nominal impedance of the connecting equipment.

Note 2: The balance network of each trunk unit is software selectable between resistive 600 ohms, 3COM, or 3CM2. 3COM and 3CM2 balance network options are provided by jumper setting (J4.X). See Table 26.

Connections

The NT5D28AA XDIDI card connects to the backplane through a 160-pin connector shroud. The backplane is cabled to the input/output (I/O) panel, which is cabled to the Main Distribution Frame (MDF) by 25-pair cables. External equipment, such as Recorded Announcement machines, Paging equipment, and Central Office facilities, connect to the card at the MDF.

Hardware installation

Tables 28 to 31 provide cross connect information for the NT5D28AA XDIDI card.

Table 28
NT5D28AA XDIDI connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
DID			A	E	K	R	
TO RO	26 1	W-BL BL-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 29
NT5D28AA XDIDI connections for NT8D37 I/O panel connectors B, F, L, S (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
DID			B	F	L	S	
TO RO	26 1	W-BL BL-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 29
NT5D28AA XDIDI connections for NT8D37 I/O panel connectors B, F, L, S (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
DID			B	F	L	S	
TO RO	42 17	Y-O O-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 1
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 2
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 3
	49 24	V-BR BR-V					

Table 30
NT5D28AA XDIDI connections for NT8D37 I/O panel connectors C, G, M, T (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
DID			C	G	M	T	
T4 R4	26 1	W-BL BL-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 4
	27 2	W-O O-W					
T5 R5	28 3	W-G G-W					Unit 5
	29 4	W-BR BR-W					
T6 R6	30 5	W-S S-W					Unit 6
	31 6	R-BL BL-R					
T7 R7	32 7	R-O O-R					Unit 7
	33 8	R-G G-R					

Table 30
NT5D28AA XDIDI connections for NT8D37 I/O panel connectors C, G, M, T (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
DID			C	G	M	T	
TO RO	34 9	R-BR BR-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
	35 10	R-S S-R					
T1 R1	36 11	BK-BL BL-BK					Unit 1
	37 12	BK-O O-BK					
T2 R2	38 13	BK-G G-BK					Unit 2
	39 14	BK-BR BR-BK					
T3 R3	40 15	BK-S S-BK					Unit 3
	41 16	Y-BL BL-Y					
T4 R4	42 17	Y-O O-Y					Unit 4
	43 18	Y-G G-Y					
T5 R5	44 19	Y-BR BR-Y					Unit 5
	45 20	Y-S S-Y					
T6 R6	46 21	V-BL BL-V					Unit 6
	47 22	V-O O-V					
T7 R7	48 23	V-G G-V					Unit 7
	49 24	V-BR BR-V					

Table 31
NT5D28AA XDIDI connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead	Pins	Pair color	Unit number
T0 R0	26 1	W-BL BL-W	Unit 0
	27 2	W-O O-W	
T1 R1	28 3	W-G G-W	Unit 1
	29 4	W-BR BR-W	
T2 R2	30 5	W-S S-W	Unit 2
	31 6	R-BL BL-R	
T3 R3	32 7	R-O O-R	Unit 3
	33 8	R-G G-R	
T4 R4	34 9	R-BR BR-R	Unit 4
	35 10	R-S S-R	
T5 R5	36 11	BK-BL BL-BK	Unit 5
	37 12	BK-O O-BK	
T6 R6	38 13	BK-G G-BK	Unit 6
	39 14	BK-BR BR-BK	
T7 R7	40 15	BK-S S-BK	Unit 7
	41 16	Y-BL BL-Y	

Self-test

When the card is installed, the red Light Emitting Diode (LED) on the faceplate flashes as the self-test runs. If the self-test completes successfully, the LED flashes three times and remains continuously lit until the card is automatically enabled (if it has been configured in software) after which the LED goes out. If the self-test fails, the LED will remain lit.

Trunk configuration

Route Data Block

Each trunk unit on the NT5D28AA XDIDI card is attached to a route with an associated Route Data Block. The Route Data Block is programmed in overlay 16, as described in Table 32.

Table 32
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	Add a new data block to the system
TYPE	RDB	Define a new Route Data Block
CUST	xx	Enter customer number
ROUT	0–511 0-127	Enter route number For Option 11
TKTP	DID	Define trunk type as Direct Inward Dialing
ICOG	IAO	Incoming and Outgoing trunk

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NT5D28AA XDIDI, as described in Table 33.

Table 33
LD 14 Trunk Data Block

Prompt	Response	Comments
REQ	NEW	Define a new trunk unit
TYPE	DID	Direct Inward Dial trunk data block
TN	l s c u c u	Terminal number of the unit For Option 11
XTRK	EXUT	Type is IPE EXUT (This prompt is required only for the first unit, unit 0, defined on each NT5D28AA card.)
SIGL	LDR	Loop Dial Repeating signaling
TIMP	600	Termination impedance
BIMP	600 (3COM)	Balance impedance
STRI	IMM	Immediate start arrangement incoming
	DDL	Delayed Dial
	WNK	Wink or Fast Flash
STRO	IMM	Immediate start arrangement outgoing
	DDL	Delayed Dial
	WNK	Wink or Fast Flash
SUPN	YES	Answer and disconnect supervision required
CLS	(DIP) DTN	Dial Pulse Digitone

Technical description

Electrical specifications

Table 34 gives the electrical characteristics of the XDIDI card.

Table 34
Electrical characteristics for the NT5D28AA XDIDI card

Characteristic	XDIDI
Terminal impedance	600 Ω
Balance impedance	600 Ω (Note 1), 3COM, or 3CM2 (Note 2)
Supervision type	(with ans sup)
DC signaling loop length (max)	2450 Ω loop with near-end battery of –44 V
Far-end battery	–42 to –52.5 V
Minimum detected loop current	10 mA
Ground potential difference	±3 V
Low DC loop resistance during outpulsing	N/A
High DC loop resistance	N/A
Ring detection	N/A
Line leakage	≥ 30k Ω, tip-to-ring, tip-to-ground, ring-to-ground
AC induction rejection	10 V rms, tip-to-ring, tip-to-ground, ring-to-ground
Note 1: Selected in software. ***Note 2:*** Selected by jumper strap settings on card and in software.	

Power requirements

Table 35 provides the power requirements for the NT5D28AA XDIDI card.

Table 35
NT5D28AA power requirements

V (volts)	I (mA) Idle	I (mA) Seize
±15V (Note 1)	350	350
+8.5V (Note 2)	450	450
-48V	346	411

Note 1: Analog circuitry is powered with +/- 12V generated from +/- 15V. The maximum current imbalance between the +/-15V rails is 100 mA.

Note 2: 8.5V is regulated to provide 5V.

Environmental specifications

Table 36 provides the environmental specifications for the NT5D28AA XDIDI card.

Table 36
NT5D28AA environmental specifications

Parameter	Limit
Operating temperature	10 to +45 degrees C, ambient
Operating humidity	20 to 80% relative humidity
Storage temperature	-20 to +60 degrees C
Storage humidity	5 to 95% relative humidity

Transmission parameters

The NT5D28AA XDIDI card provides fixed loss in both the analog to digital and digital to analog directions.

The insertion loss values are as follows:

— Loss A/D: -7.0 ± 0.5 dB

— Loss D/A: 0 ± 0.5 dB

Operation

The NT5D28AA XDIDI card supports:

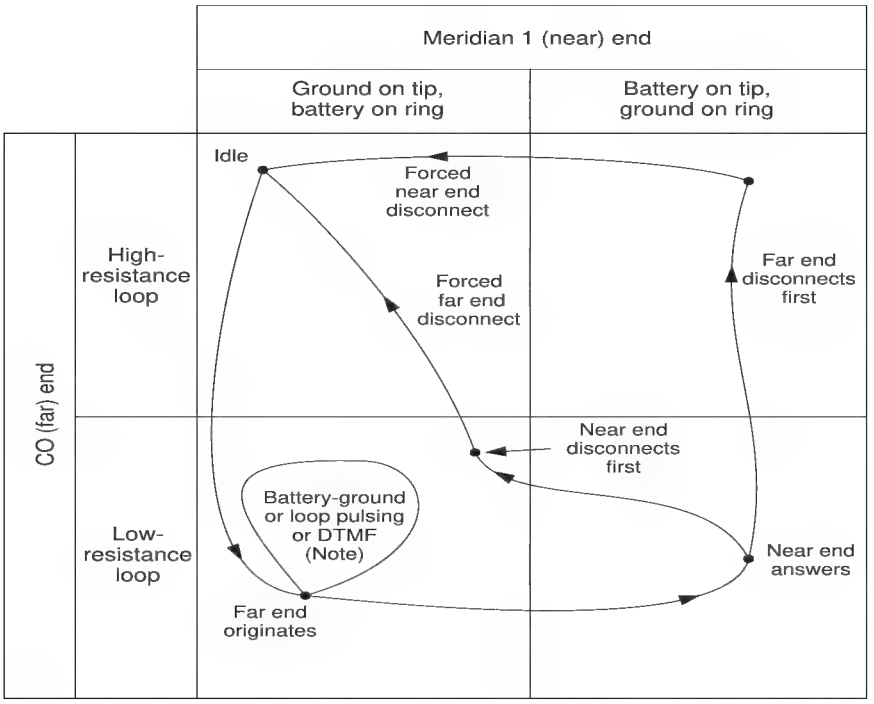
— Direct Inward Dialing operation

— Reversal On Answer/Battery Supervision

Direct Inward Dial operation

An incoming call from the CO places a low-resistance loop across the tip and ring leads (see Figures 8 and 9). Dial pulses or DTMF tones are then presented from the CO. When the called party answers, the XDIDI card reverses battery and ground on the tip and ring leads to the CO. The trunk is arranged for first party release. The CO releases the trunk by removing the low-resistance loop, at which time normal battery and ground are restored at the near end. The operation represented in Figures 8 and 9 also applies to incoming TIE trunk calls from a far-end PBX.

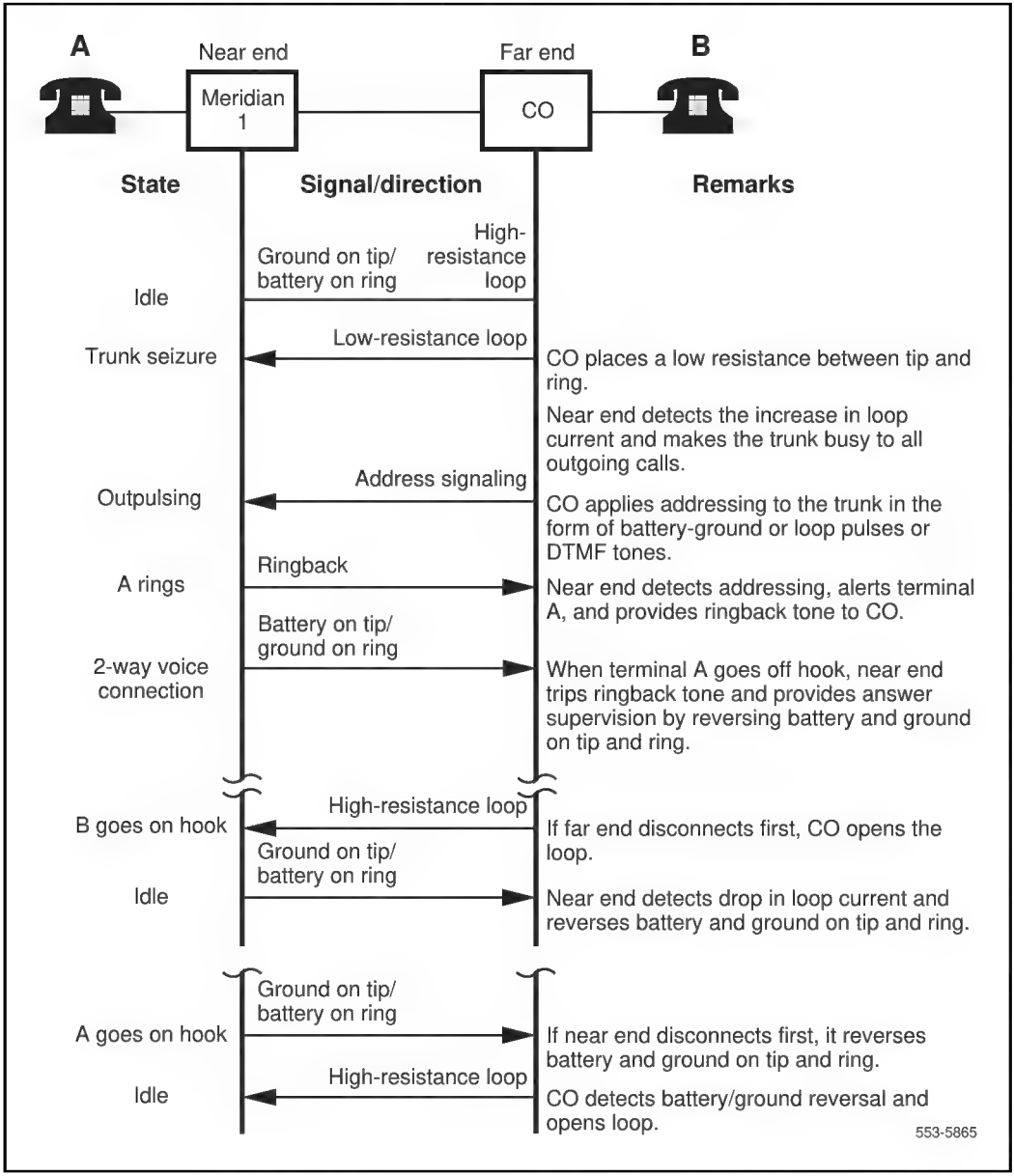
Figure 8
DID trunk, loop DR call states - incoming call from CO



Note: The near end may be configured for immediate start, delay dial, or wink start.

553-5406

Figure 9
DID trunk, loop DR call connection sequence - incoming call from CO


A
Near end
Meridian 1
Far end
CO
B
State
Signal/direction
Remarks
Idle
Ground on tip/ battery on ring
High-resistance loop
Trunk seizure
Low-resistance loop
CO places a low resistance between tip and ring.
Near end detects the increase in loop current and makes the trunk busy to all outgoing calls.
Outpulsing
Address signaling
CO applies addressing to the trunk in the form of battery-ground or loop pulses or DTMF tones.
A rings
Ringback
Near end detects addressing, alerts terminal A, and provides ringback tone to CO.
2-way voice connection
Battery on tip/ ground on ring
When terminal A goes off hook, near end trips ringback tone and provides answer supervision by reversing battery and ground on tip and ring.
B goes on hook
High-resistance loop
If far end disconnects first, CO opens the loop.
Idle
Ground on tip/ battery on ring
Near end detects drop in loop current and reverses battery and ground on tip and ring.
A goes on hook
Ground on tip/ battery on ring
If near end disconnects first, it reverses battery and ground on tip and ring.
Idle
High-resistance loop
CO detects battery/ground reversal and opens loop.
553-5865

Flexible Analog Line circuit card for India

The Dutch Flexible Analog Line Card (XFALC) NT5K02KA is being provided for use in India.

Functional description

The NT5K02KA XFALC provides an interface for up to 16 analog (500/2500-type) telephones lines. The card is a low voltage message waiting line card with 600 ohms transmission.

Common features

The NT5K02KA XFALC card:

— supports digipulse or digitone telephones

— allows telephone on-hook and off-hook detection based on loop current

— supports ground button detection

— provides relay for connecting an AC ringing signal

— collects dial pulses (10 and 20 pps) from 500-type telephones

— supports analog to digital and digital to analog conversion for 16 analog telephone lines

— provides Termination Impedance to 600 ohms

— provides software selectable A-Law or μ-Law operation

— provides line current to telephones. Line current is limited on short loops or under fault conditions. Otherwise, current varies according to loop length to allow automatic gain compensation.

Physical description

In Meridian 1 system Options 21, 21E, 51, 51C, 61, 61C, 71, 81 and 81C, the NT5K02KA XFALC card may be installed in any of slots 0 through 15 of the NT8D37 cabinet. Those using Meridian 1 system Option 21 may install the card in slots 0 through 9 of the NT8D11 cabinet.

In Meridian 1 Option 11 systems, the NT5K02KA XFALC card is installed in slots 1 through 10 of the NTAK11 main cabinet and in slots 11 through 20 in the NTAK12 expansion cabinet. In Option 11 systems equipped with Meridian Mail, the NT5K02KA XFALC card cannot be installed in slot 10 of the main cabinet or slot 20 of the expansion cabinet.

Switch settings

There are no option switches on the Flexible Analog line card. All settings are configured in software.

Connections

The Flexible Analog line card has 16 units. Each unit connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Faceplate LED

The faceplate of the NT5K02KA is equipped with a red LED which lights when all the assigned units on the circuit card are disabled.

Technical description

Power requirements

Table 37 lists the power requirements for Flexible Analog Line card.

Table 37
NT5K02KA power requirements

Voltage	Idle current	Maximum current (all units active)
+15.0 V dc	120 mA	120 mA
-15.0 V dc	24 mA	24 mA
+ 8.5 V dc	250 mA	280 mA
-48.0 V	0 mA	320 mA
- 48.0 V dc	60 mA	700 mA
Ring V ac	0 mA	160 mA (See note)

Note: This figure reflects 10 mA for ringing one telephone per unit. There may be more than one telephone or ringer on a unit.

Environmental specifications

Table 38 lists the environmental specifications of the Flexible Analog Line card.

Table 38
NT5K02KA environmental specifications

Parameter	Specifications
Operating temperature	0 to 45 degrees C, ambient
Operating humidity	5 to 95% Relative Humidity
Storage temperature	- 40 to +70 degrees C

Signalling

Loop operation

The Flexible Analog Line Card is loop start, with a loop limit of 1300 ohms at -48 V including the telephone set. The minimum and maximum values of current feed are 29 ma to 40 ma respectively. A resistance of more than 10 kohm is recognized as an idle or release signal.

Table 39 lists the number of telephone sets that can be supported by the loop.

Table 39
Loop limits

Loop resistance including telephone sets	Number of telephone sets
350 Ω or less	2
Over 350 Ω to a maximum of 1300 Ω	1

Ringers

A maximum of 5 NE-C4A ringers can be supported on one unit. Ringing is supplied to the telephones at a frequency of 25 Hz at a voltage of 86 Vrms. The peak voltage is no higher than 125V.

Message waiting indicator

The message waiting indicator consists of a lamp flashing at a rate of 1 Hz at the telephone set. (A continuously lit lamp as a message indicator is not provided). The lamp is activated as a result of a reversal of the tip and ring leads.

Digipulse dialing

The Flexible Analog line card collects all digits of 7-13 pps.

Ground button detection

The ground button detector sends a recall signal 30 to 50 ms after the application of a ground on either the tip or ring of the line. The loop resistance to the ground signal can be between 0 and 500 ohms.

The ground must be applied for a time greater than the minimum hookflash time. This time is downloaded from software and is known as the ground button validation time.

Transmission parameters

Loss values for the NT5K02KA Flexible Analog Line card are as follows:

Analog to Digital loss: 0.0 dB +/- 0.5 dB

Digital to Analog loss:+7.0 dB +/- 0.5 dB

E&M TIE trunk circuit card for India

The Swedish E&M TIE trunk card (XFEM) NT5K83FA is being provided for use in India.

Functional description

The NT5K83FA E&M TIE trunk card provides the interface between the Meridian 1 system and up to four analog trunks. Each of the four trunk circuits supported by the NT5K83FA can be individually configured as:

— 2-wire E&M BPO (Type V)

— 4-wire E&M Type II

— Recorded Announcement (RAN) trunk

— Paging (PAG) trunk

— Music (Mus) trunk

Common features

The NT5K83FA E&M TIE trunk card:

— has four switch settings (one per unit) used to select BPO (Type V) E&M signaling. Systems using Phase 8B or later software can select BPO signaling in overlay 14.

— supports "wink," "immediate start," or "delay dial" signaling

— converts transmission signals from analog-to-digital and from digital-to-analog

— provides software selectable A-law or μ-law operation

— enables and disables individual units or the entire card under software control

— provides indication of card status on the faceplate LED

— allows trunk type to be configured on a per unit basis in software

— provides Termination and Transhybrid Balance matching against Swedish complex impedance for 2-wire E&M trunk circuits

— provides termination against 600 ohms for 4-wire trunk circuits

— provides flexible transmission for various loss plans

— provides paging (PAG), recorded announcement (RAN), and music (MUS) interfaces

Physical description

In Meridian 1 system Options 21, 21E, 51, 51C, 61, 61C, 71, 81 and 81C, the NT5K083FA XFEM card may be installed in any of slots 0 through 15 of the NT8D37 cabinet. Those using Meridian 1 system Option 21 may install the card in slots 0 through 9 of the NT8D11 cabinet.

In Meridian 1 Option 11 systems, the NT5K083FA XFEM card is installed in slots 1 through 10 of the NTAK11 main cabinet and in slots 11 through 20 in the NTAK12 expansion cabinet. In Option 11 systems equipped with Meridian Mail, the NT5K083FA XFEM card cannot be installed in slot 10 of the main cabinet or slot 20 of the expansion cabinet.

Switch settings

There are four switch settings on the NT5K83FA circuit card, one for each trunk unit. The switches are used to select Type V E&M signaling. (Type II E&M is selected in software). These switch settings are described in Table 40.

Note: In order for Type V signaling to work, the TYP prompt in LD 14 must be set to TY1 or to "BPO" if available.

Table 40
NT5K83FA E&M TIE trunk card switch settings

Signaling	Switch Setting (J1.x) Pins 1-2	Pins 2-3
4-wire Type II RAN MUS PAG	Closed	Open
2-wire Type V (BPO)	Open	Closed

Connections

Each unit on the E&M card connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Hardware installation

Tables 41 to 56 provide cross connect information for the NT5K83FA E&M TIE trunk card. Four pairs of interfaces exist on each unit.

— The first pair is the Receive Path.

— The second pair is the Transmit Path.

— The third pair (E&M) is used for signaling.

— The fourth pair is used for RAN, Paging, and Type II signaling.

Table 41
NT5K83FA E&M 2-Wire Type V connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
E&M			A	E	K	R	
TO RO	27 2	W-O O-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
E M	28 3	W-G G-W					
T1 R1	31 6	R-BL BL-R					Unit 1
E M	32 7	R-O O-R					
T2 R2	35 10	R-S S-R					Unit 2
E M	36 11	BK-BL BL-BK					
T3 R3	39 14	BK-BR BR-BK					Unit 3
E M	40 15	BK-S S-BK					

Table 42
NT5K83FA E&M 2-Wire Type V connections for NT8D37 I/O panel connectors B, F, L, S

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
E&M			B	F	L	S	
TO RO	27 2	W-O O-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
E M	28 3	W-G G-W					
T1 R1	31 6	R-BL BL-R					Unit 1
E M	32 7	R-O O-R					
T2 R2	35 10	R-S S-R					Unit 2
E M	36 11	BK-BL BL-BK					
T3 R3	39 14	BK-BR BR-BK					Unit 3
E M	40 15	BK-S S-BK					
TO RO	43 18	Y-G G-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
E M	44 19	Y-BR BR-Y					
T1 R1	47 22	V-O O-V					Unit 1
E M	48 23	V-G G-V					

Table 43
NT5K83FA E&M 2-Wire Type V connections for NT8D37 I/O panel connectors C, G, M, T

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
E&M			C	G	M	T	
T2 R2	27 2	W-O O-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 2
E M	28 3	W-G G-W					
T3 R3	31 6	R-BL BL-R					Unit 3
E M	32 7	R-O O-R					
T0 R0	35 10	R-S S-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
E M	36 11	BK-BL BL-BK					
T1 R1	39 14	BK-BR BR-BK					Unit 1
E M	40 15	BK-S S-BK					
T2 R2	43 18	Y-G G-Y					Unit 2
E M	44 19	Y-BR BR-Y					
T3 R3	47 22	V-O O-V					Unit 3
E M	48 23	V-G G-V					

Table 44
NT5K83FA E&M 2-Wire Paging trunk connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
Paging			A	E	K	R	
TO RO	27 2	W-O O-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
A PG	29 4	W-BR BR-W					
T1 R1	31 6	R-BL BL-R					Unit 1
A PG	33 8	R-G G-R					
T2 R2	35 10	R-S S-R					Unit 2
A PG	37 12	BK-O O-BK					
T3 R3	39 14	BK-BR BR-BK					Unit 3
A PG	41 16	Y-BL BL-Y					

Table 45
NT5K83FA E&M 2-Wire Paging trunk connections for NT8D37 I/O panel connectors B, F, L, S

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
Paging			B	F	L	S	
TO RO	27 2	W-O O-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
A PG	29 4	W-BR BR-W					
T1 R1	31 6	R-BL BL-R					Unit 1
A PG	33 8	R-G G-R					
T2 R2	35 10	R-S S-R					Unit 2
A PG	37 12	BK-O O-BK					
T3 R3	39 14	BK-BR BR-BK					Unit 3
A PG	41 16	Y-BL BL-Y					
TO RO	43 18	Y-G G-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
A PG	45 20	Y-S S-Y					
T1 R1	47 22	V-O O-V					Unit 1
A PG	49 24	V-BR BR-V					

Table 46
NT5K83FA E&M 2-Wire Paging trunk connections for NT8D37 I/O panel connectors C, G, M, T

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
Paging			C	G	M	T	
T2 R2	27 2	W-O O-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 2
A PG	29 4	W-BR BR-W					
T3 R3	31 6	R-BL BL-R					Unit 3
A PG	33 8	R-G G-R					
T0 R0	35 10	R-S S-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
A PG	37 12	BK-O O-BK					
T1 R1	39 14	BK-BR BR-BK					Unit 1
A PG	41 16	Y-BL BL-Y					
T2 R2	43 18	Y-G G-Y					Unit 2
A PG	45 20	Y-S S-Y					
T3 R3	47 22	V-O O-V					Unit 3
A PG	49 24	V-BR BR-V					

Table 47
NT5K83FA E&M 2-Wire Recorded Announcement trunk connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
RAN			A	E	K	R	
TO RO	26 1	W-BL BL-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
SIG B SIG A	29 4	W-BR BR-W					
T1 R1	30 5	W-S S-W					Unit 1
SIG B SIG A	33 8	R-G G-R					
T2 R2	34 9	R-BR BR-R					Unit 2
SIG B SIG A	37 12	BK-O O-BK					
T3 R3	38 13	BK-G G-BK					Unit 3
SIG B SIG A	41 16	Y-BL BL-Y					

Table 48
NT5K83FA E&M 2-Wire Recorded Announcement trunk connections for NT8D37 I/O panel connectors B, F, L, S

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
RAN			B	F	L	S	
T0 R0	26 1	W-BL BL-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
SIG B SIG A	29 4	W-BR BR-W					
T1 R1	30 5	W-S S-W					Unit 1
SIG B SIG A	33 8	R-G G-R					
T2 R2	34 9	R-BR BR-R					Unit 2
SIG B SIG A	37 12	BK-O O-BK					
T3 R3	38 13	BK-G G-BK					Unit 3
SIG B SIG A	41 16	Y-BL BL-Y					
T0 R0	42 17	Y-O O-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
SIG B SIG A	45 20	Y-S S-Y					
T1 R1	46 21	V-BL BL-V					Unit 1
SIG B SIG A	49 24	V-BR BR-V					

Table 49
NT5K83FA E&M 2-Wire Recorded Announcement trunk connections for NT8D37 I/O panel connectors C, G, M, T

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
RAN			C	G	M	T	
T2 R2	26 1	W-BL BL-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 2
SIG B SIG A	29 4	W-BR BR-W					
T3 R3	30 5	W-S S-W					Unit 3
SIG B SIG A	33 8	R-G G-R					
T0 R0	34 9	R-BR BR-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
SIG B SIG A	37 12	BK-O O-BK					
T1 R1	38 13	BK-G G-BK					Unit 1
SIG B SIG A	41 16	Y-BL BL-Y					
T2 R2	42 17	Y-O O-Y					Unit 2
SIG B SIG A	45 20	Y-S S-Y					
T3 R3	46 21	V-BL BL-V					Unit 3
SIG B SIG A	49 24	V-BR BR-V					

Table 50
NT5K83FA E&M 4-Wire Type II connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
E&M 4-wire			A	E	K	R	
RA/RB TA/TB	26 / 1 27 / 2	W-BL / BL-W W-O / O-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
E1/E2 M1/M2	28 / 3 29 / 4	W-G / G-W W-BR / BR-W					
RA/RB TA/TB	30 / 5 31 / 6	W-S / S-W R-BL / BL-R					Unit 1
E1/E1 M1/M2	32 / 7 33 / 8	R-O / O-R R-G / G-R					
RA/RB TA/TB	34 / 9 35 / 10	R-BR / BR-R R-S / S-R					Unit 2
E1/E1 M1/M2	36 / 11 37 / 12	BK-BL / BL-BK BK-O / O-BK					
RA/RB TA/TB	38 / 13 39 / 14	BK-G / G-BK BK-BR / BR-BK					Unit 3
E1/E1 M1/M2	40 / 15 41 / 16	BK-S / S-BK Y-BL / BL-Y					

Table 51
NT5K83FA E&M 4-Wire Type II trunk connections for NT8D37 I/O panel connectors B, F, L, S

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
E&M 4-wire			B	F	L	S	
RA/RB TA/TB	26 / 1 27 / 2	W-BL / BL-W W-O / O-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
E1/E2 M1/M2	28 / 3 29 / 4	W-G / G-W W-BR / BR-W					
RA/RB TA/TB	30 / 5 31 / 6	W-S / S-W R-BL / BL-R					Unit 1
E1/E1 M1/M2	32 / 7 33 / 8	R-O / O-R R-G / G-R					
RA/RB TA/TB	34 / 9 35 / 10	R-BR / BR-R R-S / S-R					Unit 2
E1/E1 M1/M2	36 / 11 37 / 12	BK-BL / BL-BK BK-O / O-BK					
RA/RB TA/TB	38 / 13 39 / 14	BK-G / G-BK BK-BR / BR-BK					Unit 3
E1/E1 M1/M2	40 / 15 41 / 16	BK-S / S-BK Y-BL / BL-Y					
RA/RB TA/TB	42 / 17 43 /18	Y-O / O-Y Y-G / G-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
E1/E1 M1/M2	44 / 19 45 / 20	Y-BR / BR-Y Y-S / S-Y					
RA/RB TA/TB	46 / 21 47 / 22	V-BL / BL-V V-O / O-V					Unit 1
E1/E1 M1/M2	48 / 23 49 / 24	V-G / G-V V-BR / BR-V					

Table 52
NT5K83FA E&M 4-WireType II trunk connections for NT8D37 I/O panel connectors C, G, M, T

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
E&M 4-wire			C	G	M	T	
RA/RB TA/TB	26 / 1 27 / 2	W-BL / BL-W W-O / O-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 2
E1/E1 M1/M2	28 / 3 29 / 4	W-G / G-W W-BR / BR-W					
RA/RB TA/TB	30 / 5 31 / 6	W-S / S-W R-BL / BL-R					Unit 3
E1/E1 M1/M2	32 / 7 33 / 8	R-O / O-R R-G / G-R					
RA/RB TA/TB	34 / 9 35 / 10	R-BR / BR-R R-S / S-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
E1/E1 M1/M2	36 / 11 37 / 12	BK-BL / BL-BK BK-O / O-BK					
RA/RB TA/TB	38 / 13 39 / 14	BK-G / G-BK BK-BR / BR-BK					Unit 1
E1/E1 M1/M2	40 / 15 41 / 16	BK-S / S-BK Y-BL / BL-Y					
RA/RB TA/TB	42 / 17 43 /18	Y-O / O-Y Y-G / G-Y					Unit 2
E1/E1 M1/M2	44 / 19 45 / 20	Y-BR / BR-Y Y-S/ S-Y					
RA/RB TA/TB	46 / 21 47 / 22	V-BL / BL-V V-O / O-V					Unit 3
E1/E1 M1/M2	48 / 23 49 / 24	V-G / G-V V-BR / BR-V					

Table 53
NT5K83FA E&M 2-Wire Type V trunk connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead	Pins	Pair color	Unit number
T0 R0	27 2	W-O O-W	Unit 0
E M	28 3	W-G G-W	
T1 R1	31 6	R-BL BL-R	Unit 1
E M	32 7	R-O O-R	
T2 R2	35 10	R-S S-R	Unit 2
E M	36 11	BK-BL BL-BK	
T3 R3	39 14	BK-BR BR-BK	Unit 3
E M	40 15	BK-S S-BK	

Table 54
NT5K83FA E&M 2-Wire Paging trunk connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead designations	Pins	Pair color	Unit number
T0 R0	27 2	W-O O-W	Unit 0
A PG	29 4	W-BR BR-W	
T1 R1	31 6	R-BL BL-R	Unit 1
A PG	33 8	R-G G-R	
T2 R2	35 10	R-S S-R	Unit 2
A PG	37 12	BK-O O-BK	
T3 R3	39 14	BK-BR BR-BK	Unit 3
A PG	41 16	Y-BL BL-Y	

Table 55
NT5K83FA E&M 2-Wire Recorded Announcement trunk connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead designations	Pins	Pair color	Unit number
T0 R0	26 1	W-BL BL-W	Unit 0
SIG B SIG A	29 4	W-BR BR-W	
T1 R1	30 5	W-S S-W	Unit 1
SIG B SIG A	33 8	R-G G-R	
T2 R2	34 9	R-BR BR-R	Unit 2
SIG B SIG A	37 12	BK-O O-BK	
T3 R3	38 13	BK-G G-BK	Unit 3
SIG B SIG A	41 16	Y-BL BL-Y	

Table 56
NT5K83FA 4-Wire (Transmission) Type II (Signaling) connections for Option 11 NTAK11 and NTAK12 I/O panel connectors

Lead designations	Pins	Pair color	Unit number
RA RB	26 1	W-BL BL-W	Unit 0
TA TB	27 2	W-O O-W	
E M	28 3	W-G G-W	
SIG0A SIG0B	29 4	BR-W W-BR	
RA RB	30 5	W-S S-W	Unit 1
TA TB	31 6	R-BL BL-R	
E M	32 7	R-O O-R	
SIG1A SIG1B	33 8	R-G G-R	
RA RB	34 9	R-BR BR-R	Unit 2
TA TB	35 10	R-S S-R	
E M	36 11	BK-BL BL-BK	
SIG2A SIG2B	37 12	BK-O O-BK	
RA RB	38 13	BK-G G-BK	Unit 3
TA TB	39 14	BK-BR BR-BK	
E M	40 15	BK-S S-BK	
SIG3A SIG3B	41 16	Y-BL BL-Y	

Note: TA, TB are the designated as the transmit pair and RA, RB are designated as the receive pair.

Self-test

When the card is installed, the red Light Emitting Diode (LED) on the faceplate flashes as the self-test runs. If the self-test completes successfully, the LED flashes three times and remains continuously lit until the card is automatically enabled (if it has been configured in software) after which the LED goes out. If the self-test fails, the LED will remain lit.

Trunk configuration

Route Data Block

Each trunk unit on the NT5K83FA E&M trunk card is attached to a route with an associated Route Data Block. The Route Data Block is programmed in overlay 16.

Table 57
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	Add a new data block to the system
TYPE	RDB	Define a new Route Data Block
CUST	xx	Enter customer number
ROUT	0–511 0-127	Enter route number For Option 11
TKTP	TIE RAN PAG	Define trunk type as TIE Define trunk type as Recorded Announcement Define trunk type as Paging
ICOG	IAO	Incoming and Outgoing trunk
ACOD	XX	Trunk route access code

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NT5K83FA E&M TIE trunk card, as described in Table 58.

Table 58
LD 14 Trunk Data Block

Prompt	Response	Comments
REQ	NEW	Define a new trunk unit
TYPE	TIE RAN PAG	TIE trunk data block Recorded Announcement trunk data block Paging trunk data block
TN	l s c u c u	Terminal number For Option 11
XTRK	XFEM	Type is IPE XFEM. (This prompt is required only for the first unit, unit 0, defined on the card.)
SIGL	EM4 EAM	4 wire E&M 2-wire E&M
EMTY	 (TY2) TY1	E&M Type Type 2 signaling Type 1 signaling (Also use TY1 for Type V or BPO)
STRI	IMM DDL WNK	Immediate start arrangement incoming Delayed Dial Wink or Fast Flash
STRO	IMM DDL WNK	Immediate start arrangement outgoing Delayed Dial Wink or Fast Flash
SUPN	YES, (NO)	Answer and disconnect supervision
CLS	(DIP) DTN	Dial Pulse Digitone

Technical description

Power requirements

Table 59 lists the power requirements for the NT5K83FA E&M TIE trunk card.

Table 59
NT5K83FA power requirements

Voltage	Active Current
+/- 15.0 V dc	150 mA
+8.5 V dc	35 mA
+ 5 V dc	110 mA
-48 V dc	80 mA

Environmental specifications

Table 60 provides the environmental specifications for the NT5K83FA E&M TIE trunk card.

Table 60
NT5K83FA environmental specifications

Parameter	Limit
Operating temperature	10 to 45 degrees C, ambient
Operating humidity	20 to 80% RH (non condensing)
Storage temperature	-20 to +60 degrees C

Transmission parameters

The loss values for all modes of operation on the E&M TIE trunk card are shown in Table 61.

Table 61
Loss values for all modes of operation on the NT5K83FA

Mode	Pads	A/D Loss (dB)	D/A Loss (dB)
4-wire Mode	Pad out	-3.5	3.5
(EM4)	Pad in	2.5	3.5
RAN		0.0	N/A
PAGING		N/A	0.0
2-wire Mode	Pad out	-2.0	3.0
(EAM))	Pad in	0.0	5.0

Trunk types description

Each unit on the NT5K83FA E&M TIE trunk card supports:

— 2-wire E&M Type V (BPO)

— 4-wire E&M Type II

— Recorded Announcement (RAN) trunk

— Paging (PAG) trunk

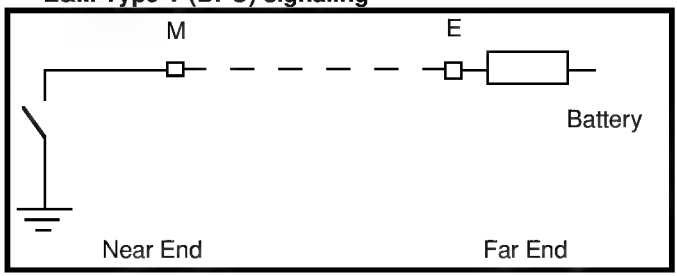
E&M TIE trunk operation

The NT5K83FA E&M TIE trunk supports Type II and Type V methods of signaling.

Type V (BPO) E&M send and receive signals

Type V (BPO) E&M signaling uses use two signaling leads, E and M, that are electrically separated from the associated speech circuit. Signals are sent on the M lead and received on the E lead as shown in Figure 10. Earth is used for the signal return path.

Figure 10
E&M Type V (BPO) signaling



Send signals
In Type V (BPO) mode, all signals are sent as either "Earth on" or "Earth off" applied to the M wire. Earth off consists of open circuit applied to the M wire, Earth on is the application of ground to the M wire.

Receive signals
All signals are received as either "Earth on" or "Earth off" applied to the E wire, where:

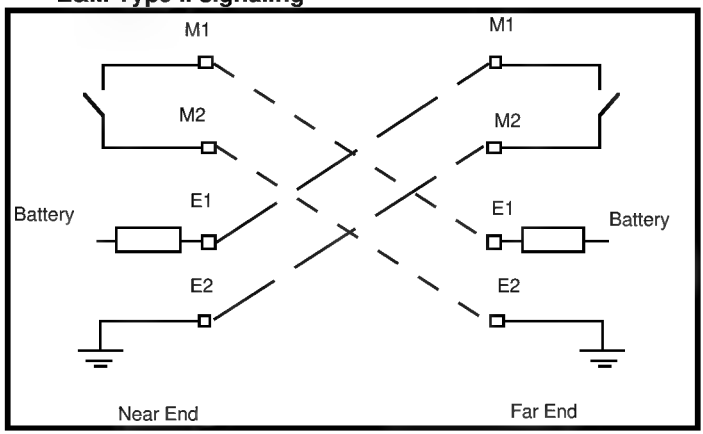
— Earth on is the application of ground to the E wire through a resistance of up to 1500 ohms

— Earth off is the application of ground to the E wire through a resistance of up to 20 Kohms.

Type II E&M send and receive signals

Type II E&M operation uses two signaling pairs, E and M, that are electrically separated from the associated speech circuit. Signals are sent on the M pair and received on the E pair, as shown in Figure 11.

Figure 11
E&M Type II signaling



Send signals
All signals are sent as either an "Open" or "Closed" condition applied to the M wire pair.

Receive signals
All signals are received as either an "Open" or "Closed" condition applied to the E wire, where:

— The Closed condition is a resistance of up to 2 Kohms applied to the E wire pair

— The Open condition is a resistance of greater than 20 Kohms applied to the E wire pair.

Type II and Type V signaling

Tables 62 and 63 provide a summary of signaling states for Type II and Type V signaling respectively.

Idle state
In the Idle state, the Meridian 1 system applies an idle signal to the M wire to indicate that it is free to accept incoming calls.

Seize
To place an outgoing call, the Meridian 1 system at the near end sends a seizing signal through the M lead to the far end. The incoming end recognizes the seize signal and prepares to receive digits.

Holding
The continued receipt of the seize signal is seen by the incoming end as a hold signal.

Dialing
The Meridian 1 system sends digits through the M lead in the form of 10 pps of the open-circuit condition.

Answer
When the called party answers, the far end sends an "answer" signal through the M lead.

Call disconnect
Either party can disconnect the call by applying a clear signal to the M lead. The far end applies a "clear back" signal, while the near end applies a "clear forward" signal. The circuit remains busy until both clear forward and clear backward signals have been exchanged.

Table 62
Summary of NT5K83FA Type II signaling states

Signal	Outgoing PBX sending condition - M wire	Incoming PBX sending condition - M wire
Idle	Open	Open
Seize	Closed	—
Hold	Continuation of seizing signal	—
Digit Pulse	Open pulses in step with dial pulses	—
Answer	—	Closed
Clear forward	Open for longer than 300 milliseconds	—
Clear back	—	Open for longer than 300 milliseconds

Table 63
Summary of NT5K83FA Type V signaling states

Signal	Outgoing PBX sending condition - M wire	Incoming PBX sending condition - M wire
Idle	Earth off	Earth off
Seize	Earth on	—
Hold	Continuation of seizing signal	—
Digit Pulse	Earth off pulses in step with dial pulses	—
Answer	—	Earth on
Clear forward	Earth off for longer than 300 milliseconds	—
Clear back	—	Earth off for longer than 300 milliseconds

Recorded Announcement trunk operation

When used in the Recorded Announcement mode, the trunk circuit is connected to a customer provided recorded announcement machine or a music source.

The NT5K83FA E&M TIE trunk card supports the following types of announcement machines:

— Start mode announcement machines

— Continuous mode announcement machines

Recorded announcement machines supported include the Cook Digital 4-channel announcer and the Audichron HQI-112.

Start mode

In start mode, the E&M TIE trunk card provides a startpulse to the announcement machine to begin playback of the message. The announcement source requires the following:

— an impedance of 4 ohms or less

— ground to the trunk unit when playing and an open circuit when idle. This is done through a control lead to the trunk circuit.

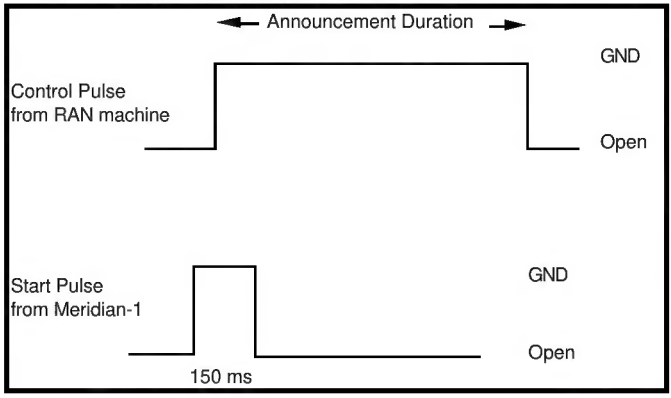
— default signal level of -9 dBm (in 600 ohms) adjustable to a level of 10 dBm.

To start the announcement, the NT5K83FA E&M TIE trunk card provides a momentary ground signal (150 ms) to the source. The announcement machine should then start playing its message.

The NT5K83FA E&M TIE trunk card expects status information from the announcement machine, that is, whether it is idle or playing. For this reason, the announcement machine requires a control lead to the trunk circuit.

Figure 12 shows recorded announcement in start mode.

Figure 12
Recorded announcement - start mode



Continuous mode

The requirements for continuous mode announcement machines are as follows:

— an impedance of 4 ohms or less

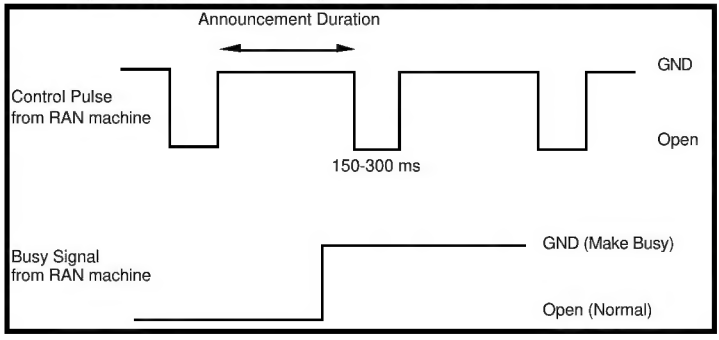
— generation of a control pulse (150 - 300 ms) at the start of the announcement period

— default signal level of -9 dBm (in 600 ohms) adjustable to a level of 10 dBm.

The announcement machine may provide a separate busy signal when the machine is recording or erasing a message or if the machine is malfunctioning. The busy signal will be used by the Meridian 1 system for maintenance purposes.

Figure 13 shows recorded announcement in continuous mode.

Figure 13
Recorded announcement - continuous mode



Music source

The music source should provide an impedance of 600 ohms. The default signaling level should be -9 dBm (in 600 ohms) adjustable to a level of 10 dBm.

Paging trunk operation

When used in the paging mode, the trunk circuit is connected to a customer-provided paging amplifier system. When accessed, the card provides a loop closure. In a typical application, the loop closure will cut off a music supply and switch the paging trunk transmission path to the paging amplifier.

Option 11 & Meridian 1

Intelligent Peripheral Equipment Circuit Cards for India

Description and installation

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